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HARVARD UNIVERSITY
ARNOLD ARBORETUM
PRESENTED BY
CHARLES - SPRAGUE - SARGENT
1892

DEPOSITED AT THE
HARVARD FOREST
1941

AM
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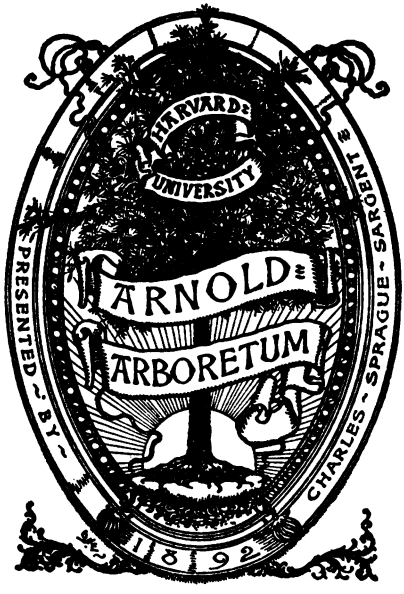

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1941

FIRST REPORT

OF THE

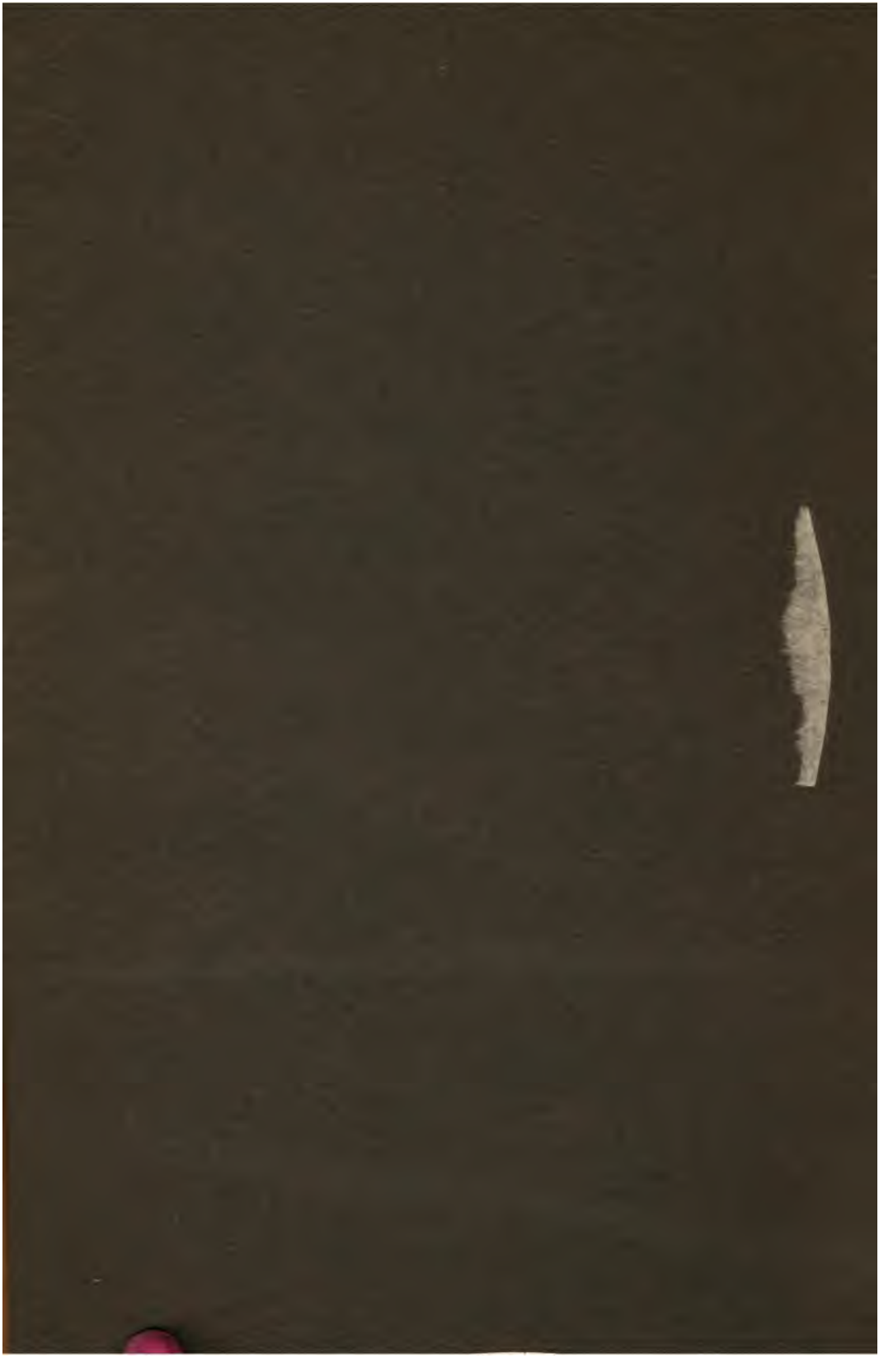
BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY

OF THE

TERRITORY OF HAWAII.

For the period from
JULY 1, 1903, TO DECEMBER 31, 1904

HONOLULU:
THE BULLETIN PUBLISHING CO., LTD.
1905.



FIRST REPORT

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For the period from
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1905.

FORESTRY.

To the Legislature of the Territory of Hawaii:

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes report of the status and acts of this Board since its appointment, to December 31st, 1904.

ORGANIZATION OF BOARD.

The law under which the Board is organized is Act 44 of the Territorial laws of 1903, approved April 25th, 1903.

Under its provisions, Governor Dole, on the 13th day of May, 1903, appointed W. M. Giffard, A. W. Carter, James D. Dole, J. F. Brown and L. A. Thurston as Commissioners. The Superintendent of Public Works is ex-officio a member and executive officer of the Board.

On May 18, 1903, the Board organized by electing L. A. Thurston President, and Henry E. Cooper, Superintendent of Public Works, as Secretary. Upon the resignation of Henry E. Cooper, his successor, C. S. Holloway, was elected Secretary.

The Board later sub-divided itself into committees, as follows, viz.:

Forestry and Nursery—Messrs. L. A. Thurston, W. M. Giffard and A. W. Carter.

Entomology—Messrs. W. M. Giffard and J. F. Brown.

Finance—Messrs. C. S. Holloway and W. M. Giffard.

Rules and Regulations—Messrs. L. A. Thurston and A. W. Carter.

Agriculture—Messrs. Jas. D. Dole and J. F. Brown.

Under the statute one of the Commissioners retires on the first of January of each year.

The commission of L. A. Thurston having expired, he was reappointed January 1, 1905.

Each of the principal matters coming before the Board is referred to the appropriate committee and consideration thereof and report thereon made by such committee. In addition to the committee meetings the Board has held fifty-two meetings, and two public hearings relating to proposed forest reserves.

HEADQUARTERS OF BOARD.

Upon the organization of the Board it found itself quartered in two rooms in the basement of the Executive Building, dark, stuffy and entirely inadequate in every way.

The corrugated iron building at the government nursery on King street, theretofore used as laborers' quarters, and for fumigation and storage purposes, was floored, ceiled and painted by Henry De Fries at an expense of $4,264 and converted into comfortable quarters, ample for the present for all the purposes of the Board. It includes a museum room for showing collections of woods and fruits; a library in which meetings of the Board and other meetings are held; offices for the Superintendent of Forestry and Superintendent of Entomology; Entomologist's laboratory, insect breeding-room, store-room and office of clerk and stenographer.

This building was occupied by the Board in February, 1904. It is only ten minutes distant, by street car, from the center of the city, and, being situate in the large yard constituting the nursery, is admirably located and adapted to its uses.

POWERS AND DUTIES OF BOARD.

The statute creating the Board devolves upon it the execution of all existing statutes relating to the subjects coming within its jurisdiction, and specifically enumerates the following duties:

(1) To gather, compile and publish information and statistics concerning forestry, entomology, plant pathology and general agriculture and to establish a library of publications germane to the subjects covered by the act;

(2) To co-operate with other organizations doing work coming within the scope of the subject matter of the act, more particularly the Federal Agricultural Experiment Station, avoiding as far as practicable, duplication of their work;

(3) To make rules and regulations, subject to the approval of the Governor, in connection with the subject matters of the act;

(4) To appoint a Superintendent of Forestry, District Foresters, Assistant Foresters and Forest Rangers;

(5) To have the care and control of forest reserves;

(6) To devise ways and means for protecting and making available springs, streams and other sources of water supply;

(7) To devise ways and means for making forest reserves self-supporting;

(8) To secure the fencing of forest reserves and exclusion of stock therefrom;

(9) To appoint a Superintendent of Entomology and Assistants thereto;

(10) To provide building and apparatus for quarantine and disinfection of fruits and plants and for the obtaining and distribution of beneficial insects;

(11) To supervise and direct all officers and all expenditures authorized by the act;

(12) To formulate and recommend additional legislation;

(13) To make annual reports of the proceedings and expenditures of the Board.

Sub-Division of Powers and Duties.

These powers and duties naturally divide themselves into the following sub-divisions, viz.:

1. General Objects, Powers and Duties;
2. Matters appertaining to Forestry;
3. Matters appertaining to Entomology;
4. Matters appertaining to Agriculture.

For purposes of greater clearness these subjects are treated in the order named.

GENERAL OBJECTS, POWERS AND DUTIES.

LIBRARY.

A library has been established, relating to the subject matters enumerated in the act, which now contains approximately 2,848 books, pamphlets and magazines on Agriculture, Forestry and general subjects, and 494 on Entomology, a total of 3,342. In addition to this the Hawaiian Stock Breeders' Association has deposited with the Board its library of 16 bound volumes, and 138 pamphlets and magazines, a total of 154, or a grand total available for consultation and study of 3,496. The entire library is open to the public.

The following is a detailed classification of the library:

LIST OF PUBLICATIONS IN THE LIBRARY OF THE BOARD OF AGRICULTURE AND FORESTRY.

RELATING TO AGRICULTURE, FORESTRY AND GENERAL SUBJECTS.

	Number.	
	Bound Volumes.	Pamphlets.
Publications of U. S. Department of Agriculture	62	620
Publications of other U. S. Departments:		
U. S. National Museum	14	.....
Smithsonian Institution	18	.....
Census Bureau	14	16
Publication of State Experiment Stations (including Hawaii)	48	1,200
Publications of Government of Philippine Islands	..	65
Publications of Government of Porto Rico	1	1
Publications of Agricultural Departments of Foreign Countries:		
Australia	..	65
Brazil	..	40
Canada	..	50
Ceylon	..	20
England	..	16
Germany	..	25
India (Calcutta)	..	151
Japan	..	21
Java	..	55
Madras	..	12
Netherlands	..	22
New Zealand	4	100
Tasmania	..	11
West Indies	..	71

	Number Bound Volumes.	Pamphlets.
Books on Botany	17	4
" " Forestry	13	1
" " Irrigation	4	.....
" " General Agriculture	8	.....
" " General Science	9	.....
" " Law	11	14
Current periodicals received regularly	..	13
Completed volumes of periodicals	..	10
(Including complete set of Hawaiian Planters' Monthly)	22	.....
	245	2,603
Total		2,848

RELATING TO ENTOMOLOGY.

	Number. Bound Volumes.	Pamphlets.
Publications of State Experiment Stations	..	210
Publications of Department of Agriculture	4	120
Publications of States, Scientific Societies and Other Institutions:		
Entomologist's Annual Reports—		
New York State	3	6
New York State Museum	..	13
New Jersey	..	4
Connecticut	..	2
New Zealand Department of Agriculture	..	4
Natal, Department of Agriculture	..	2
Cape of Good Hope	..	2
Entomological Society of Ontario	..	1
Report upon Cotton Insects	1	.....
Handbook of Destructive Insects of Victoria	3	.....

	Number	
	Bound Volumes.	Pamphlets.
Canadian Entomologist (7 vols. unbound)	18	.....
Reports, Minister of the Interior	..	6
Report, Commissioner of Agriculture	..	1
Fauna Hawaiiensis	..	12
Flora of Hawaiian Islands	1	.....
Hawaii Agricultural Experiment Station	..	4
Smithsonian Institution	..	27
U. S. National Museum	..	7
Proceedings Boston Society, Natural History	1	.....
Imperial Department of Agriculture for West Indies	..	2
Economic Entomology	1	.....
Zoological Record	39	.....
	71	423
Total		494

LIBRARY OF HAWAIIAN LIVE STOCK BREEDERS' ASSOCIATION, LOANED TO BOARD OF AGRICULTURE AND FORESTRY.

	Bound Volumes.	Pamphlets.
Books	16	90
Breeder's Gazette	..	23
Miscellaneous magazines and papers	..	25
	16	138
Total		154

SUMMARY.

Board of Agriculture Library	3,342
Live Stock Breeder's Library	154
Total	3,496

PUBLICATIONS.

The Board early felt that a medium for disseminating information concerning the subject matters which it was created to conserve, was required. In January, 1904, "The Hawaiian Forester and Agriculturist," a monthly magazine of ordinary size and of form, 25 to 50 pages, was accordingly established, under the editorship of Mr. W. M. Giffard. Mr. Giffard has rendered most valuable service in this connection free of charge

In this magazine have been published the rules adopted by the Board, many of the reports of the Superintendents of Entomology and Forestry, the official proclamations setting apart forest reserves, specially contributed articles on forestry, agriculture and entomology in Hawaii, editorials and reprinted articles from foreign publications. A valuable exchange list has been established.

The publication has proved all and more than was hoped for it. In addition to the monthly magazine, special bulletins and publications have been issued as follows:

1. Reprint of Act 44, Session Laws of 1903, of the Legislature of the Territory of Hawaii.

2. "Notice to Importers." A reprint of Sections 13 to 16, inclusive, of Act 44; a four-page circular.

3. A "Digest of Statutes relating to the Importations of Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii; a six-page circular.

4. A notice to Ship Owners, Fruit Importers and others; a three-page circular

Bulletin No. 1—Division of Entomology. "The Leaf-Hopper of the Sugar Cane," by R. C. L. Perkins; 38 pages.

Press Bulletin—Division of Entomology. "On Some Diseases of Cane specially considered in relation to the Leaf-Hopper Pest, and to the Stripping of Cane;" 4 pages. (This should be regarded as Press Bulletin No. 1, Division of Entomology.)

CO-OPERATION WITH OTHER ORGANIZATIONS.

The Board has maintained most cordial relations with the National Bureau of Forestry at Washington; the Federal Agricultural Experiment Station at Honolulu and the Hawaiian Sugar Planters' Association. The latter organization has been,

and still is most public spirited and generous in its assistance in support of the entomological division of this Board. It has for years paid half the salary of the Superintendent of Entomology. During the first year of the past period it paid one-half the salary of three of the four entomologists in the service of the Board. Even now, when it has established an elaborate entomological station of its own, it still pays half of the salary of two of the three entomologists in the employ of the Board.

The station maintained by the Planters' Association is fully equipped in the agricultural, chemical and entomological divisions, and is doing splendid work in connection with the development of the sugar cane industry. It is an institution of which any community might well be proud.

The Federal Agricultural Experiment Station is practically conducting the work of the agricultural division of this Board, its superior equipment enabling it to do this more advantageously than the Board could do it. Moreover duplicating work is prevented by this policy.

The value of the quiet but systematic work which is being carried on by this branch of the Federal Government is not fully appreciated in Hawaii. Much of the work of the staff does not produce immediate results; but as time goes on, the value to the Territory of a body of trained men who are devoting their entire time to studying ways and means of promoting diversified industries will become more and more apparent.

It must be remembered that although the chief cost of the station is borne by the Federal Government, the benefits derived therefrom inure wholly to the people of this Territory. The assistance heretofore rendered to the station by the Territorial legislature has shown valuable results, and the Board are of the opinion that the agricultural interests of Hawaii will be subserved by liberally assisting the Federal Station in the future.

A more detailed statement of the accomplishments of the station is contained hereinafter, under the head of "Agriculture."

RULES AND REGULATIONS.

The Board has passed rules and regulation, which have been approved by the Governor, as follows:

1. Prohibition of importation of cacao seeds or plants from Dutch East Indies, Ceylon and India; coffee seeds or plants from Samoa, and pineapples from Australia; September 1, 1903.

2. Prohibition of importation of banana fruits or plants from islands of the South Pacific ocean; February 10, 1904.

3. Prohibition of importation of sugar cane, except small quantities of special varieties for seed purposes; February 18, 1904.

4. Prohibition of importation of the flying fox, land crab, or any other animal, bird, reptile or insect injurious, or liable to become injurious to forests, trees, plants or other vegetation of value; October 19, 1904.

5. Prohibition of importation of fresh fruit from East or West Indies, Asia, Australia, Oceanica, Malaysia, Mexico, Central or South America, for the purpose of preventing the introduction of fruit flies and other injurious insects.

FORESTRY.

APPOINTMENT OF SUPERINTENDENT OF FORESTRY.

On November 25, 1903, the Board appointed Mr. Ralph S. Hosmer as Superintendent of Forestry on the recommendations of Gifford Pinchot, Chief of the Federal Bureau of Forestry, and of Wm. L. Hall, Chief of the Division of Forestry Extension.

Mr. Hosmer arrived in Honolulu on January 13, 1904, and began work immediately.

Mr. Hosmer is a graduate of Harvard, and of the Yale Forest School, holding the degrees of Bachelor of Agricultural Science from Harvard and of Master of Forestry from Yale. He has also been an instructor in the Yale Forest School.

Since 1896 he has been connected with the U. S. Department of Agriculture, first for two and a half years in connection with the Bureau of Soils and since then with the Bureau of Forestry. He has worked in this connection at Washington, D. C., and in Maine, New York and California.

DISTRICT FORESTERS.

District Foresters, serving without salary, have been appointed as follows:

Island of Kauai.—Albert S. Wilcox, Andrew Moore, Geo. H. Fairchild, F. Weber, J. M. Lydgate, Francis Gay.

Island of Oahu.—Paul R. Isenberg, Walter F. Dillingham, A. M. Nowell, Andrew Adams, L. L. McCandless, C. Bolte, John Herd.

Island of Molokai.—G. C. Munro.

Island of Maui.—L. Barkhausen, H. P. Baldwin, C. B. Wells, H. A. Baldwin, L. von Tempsky, Dr. J. H. Raymond.

Island of Hawaii.—E. E. Olding, F. W. Carter, D. Forbes, Geo. Ross, John Watt, Julian Monsarrat, G. C. Hewitt, Franz Buchholtz, W. R. Castle, J. D. Paris, John Maguire.

The reports of the Superintendent and of the District Foresters are appended hereto.

FOREST RESERVES.

The segregation of public and private forest reserves is one of the most vital of the objects of the forestry law.

The Board is disappointed at having to report so small an area of forest reserve as having been set apart.

The reasons are: First it was desired to secure a man in touch with the Federal Forestry Bureau. The chief of that bureau was therefore asked to recommend a man. Before doing so he wished to know more of the conditions, and therefore first sent out the Chief of the Division of Forestry Extension, Mr. William L. Hall. He made a three-months trip and a thorough examination and report. Mr. Ralph S. Hosmer was recommended and appointed, but did not get to work until January, 1904.

It was felt to be advisable that he should become acquainted with the Territory before deciding upon details of given sections. A large part of his time has therefore been consumed in inspecting the different islands and meeting the people. Organizing the office, correspondence and necessary preliminary routine detail has also taken a good deal of his time.

A good beginning has been made however. Two pieces of government land have been set apart as forest reserves:

1. The land of Kaipapau, Koolauloa, Oahu, containing an area of 913 acres.

2. The land in North Hamakua, Hawaii, lying between Waipio Valley and the Kohala district, containing approximately 17,000 acres.

Reserves in Hilo, Hawaii, Hamakua, Koolau and Makawao, Maui, and Hanalei, Kauai, are being surveyed and preliminary work has been done on reserves in a number of other districts.

Large areas have been reserved by private persons and companies, and negotiations are now under way on a large scale to secure the incorporation of these reserves with those of the government, in order to secure a homogeneous and progressive administration of the whole system.

Care of Forest Reserves.

A number of public and private forest reserves have been set apart; but as yet, owing to lack of funds, no forest rangers have

been appointed, and the only care which the reserves are getting is that given them by friendly disposed private parties living in the vicinity. This has sufficed thus far without any particular resulting harm; but as the reserves increase protecting rangers will become a necessity, both to protect the existing forest and to supervise re-foresting operations.

Self-Support of Forests.

Many of the Hawaiian forests are in such inaccessible locations that no return other than the effect on climate and the water which they conserve, can be expected from them; but in other localities there is no reason why, in the early future, a considerable revenue should not be obtained from forest products.

Fencing of Forests.

No appropriation was made for fencing forests on any scale, and none has been attempted by the Board.

Fencing stock out of the forest has been done on a large scale however by private parties. Well over 200 miles of wire fence has been constructed for this purpose.

It is believed that private persons and companies interested in maintaining forest reserves will do nearly all the fencing that will be required in the immediate future.

RE-FORESTING.

The main attempts by the government at re-foresting are at Tantalus and Nuuanu valley, Oahu.

The forest at Tantalus is doing well. No further planting has been done there for several years past. It is seeding freely and thus furnishing seed for planting elsewhere on the islands.

Planting at Nuuanu was discontinued during 1904, the results not being deemed to be commensurate with the expense. The chief obstacle to forestry growth there is the excessive and continuous wind. After some of the surviving trees heretofore planted are large enough to act as a breakwind, it will probably be sound to again plant there.

Tree planting on a small scale has been done and is still going on at a large number of places on the islands.

The principal tree planters on a large scale are G. N. Wilcox and the Lihue Plantation, on Kauai; the Haiku and Paia Plantations and the Haleakala Ranch Co., on Maui, and the Kohala Plantation, the Parker Ranch and the Pacific Sugar Mill, on Hawaii. It is hoped and believed that this list will be largely added to at an early date.

The Board already offers the free service of a tree planting expert to advise as to the best varieties of trees to plant and how to plant them. This offer has been accepted in some thirty instances. The Board hopes that more will avail themselves of the opportunity during the coming period.

Distribution of Trees and Plants.

During 1904 the Board discontinued the general free distrimution of trees and plants at the government nursery. Those on hand were sold at about cost price and the receipts paid into the Treasury as a realization. Since then only trees and plants enough for public and semi-public purposes are being grown, with a few still left on hand.

In place of the former policy, seeds of trees and valuable plants are being imported and collected from local sources, and sold at just enough to cover cost.

The reason for this course is that the expense of propagation seemed altogether out of proportion to the number benefited and the good done.

It is believed that the change of policy will accomplish much more in the way of practical increase of forest, and a considerable decrease in expense.

COLLECTION OF WOODS.

A collection of specimens of island woods has been secured and cut in such a way as to show both a segment and longitudinal section of the logs. One-half of each cut surface is polished and half left unpolished, showing the natural appearance of the wood.

The following is a list of the 44 species of woods collected, viz:

LIST OF THE HAWAIIAN WOODS IN THE MUSEUM OF THE BOARD OF AGRICULTURE AND FORESTRY.

Scientific Name.	Common Name.	Hawaiian Name.
Acacia koa	.....	Koa
Acacia koa	Black Koa	Koa
Acacia koa	Curly Koa	Koa
Acacia koaia	.....	Koaia
Albizzia saman	Monkey Pod	.....
Alphitonia ponderosa	.....	Kauila
Antidesma platyphyllum	.....	Haa
Calophyllum inophyllum	.....	Kamanu
Caesalpinio kauaiensis	.....	Uhiuhi
Cheirodendron gaudichaudii	.....	Olapa
Cocos nucifera	.....	Niu
Cordia subcordata	Cocoanut Palm	Kou
Cyanea solenocalyx	.....	Puakala
Dodonaea viscosa	.....	Aalii
Erythrina monosperma	.....	Wiliwili
Eugenia malaccensis	.....	Ohia Ai
Eugenia sandwicensis	.....	Ohia Ha
Gouldia coriacea	.....	Manono
Hibiscus kokia	.....	Kokio
Hibiscus tiliaceus	.....	Hau
Mangifera indica	Mango	Manako
Metrosideros polymorpha	.....	Ohia Lehua
Morinda citrifolia	.....	None
Myrsine kauaiensis	.....	Koolea
Myoporum sandwicensis	.....	Naio
Olea sandwicensis	.....	Pua
Pelea sp.	.....	Alani
Pipturus albidus	.....	Mamake
Psidium guajava	Guava	Kuawa
Prosopis juliflora	Algaroba	Kiawe
Reynoldsia sandwicensis	.....	Ohe
Santalum freycinetianum	Sandalwood	Iliahi
Sapindus oahuensis	.....	Kopa
Straussia hawaiiensis	.....	Kopiko
Tamarindus indica	Tamarind tree	.....

Scientific Name.	Common Name.	Hawaiian Name.
Terminalia catappa.....	Tropical almond	Kamani
Thespesia populneus.....	.....	Milo
Wikstroemia foetida	.....	Akia
.....	.....	Aawa
.....	.....	Alaa
.....	.....	Mahoe
.....	.....	Manele
.....	.....	Paihi
.....	.....	Uhiapele

ENTOMOLOGY.

APPOINTMENT OF ENTOMOLOGISTS.

Immediately after its organization the Board on May 18, 1903, appointed Prof. A. Koebele, Superintendent of Entomology, and R. C. L. Perkins as Assistant Superintendent. Later it appointed Mr. G. W. Kirkaldy an assistant, he beginning work on August 14th, 1903, and Mr. F. W. Terry, who began work on September 2nd, 1903.

The Hawaiian Sugar Planters' Association paid one-half of the salary of Messrs. Koebele, Kirkaldy and Terry.

PLANTERS' ENTOMOLOGICAL STATION.

By reason of the great destruction wrought by the leaf-hopper, the Planters decided in the summer of 1904 to establish an entomological division of their own, in connection with the experiment station, thus enabling an adequate force to devote itself exclusively to the study, and to provide remedies for cane pests and diseases.

By mutual agreement with the Board, Messrs. Perkins, Kirkaldy and Terry were transferred in August, 1904, to the Planters' Association, the latter assuming the entire payment of their salaries. These gentlemen are experts in their profession, and made a most valuable beginning in the establishment of the entomological division. We cannot regret their transfer to the Planters' station however, as with true scientific spirit, the entomologists of the two stations are in accord, assisting and supplementing the work, each of the other.

Prof. Koebele also resigned his position as superintendent, owing to the fact that his entire time was occupied in traveling abroad and obtaining parasites of injurious plants and insects.

To provide for the vacancies thus caused the Board thereupon appointed Mr. Alexander Craw of San Francisco, Superintendent of Entomology, he entering upon his duties on August 12, 1904. The Planters' Association has agreed to pay one-half of his salary.

Prof. A. Koebele was appointed Consulting Entomologist, and continued in his previous duties abroad.

Later Mr. Jacob Kotinsky of Washington, D. C., was appointed assistant, and took office September 14, 1904.

The Entomological Division of the Board is at present composed of Alexander Craw, Superintendent and Inspector; A. Koebele, Consulting Entomologist; Jacob Kotinsky, Assistant Entomologist; and C. J. Austin, Inspector's Assistant.

Professor Koebele requires no introduction to the people of Hawaii. His long and successful labors have established his reputation as one of, if not, the most eminent of economic entomologists.

Mr. Alexander Craw.

Mr. Alexander Craw is a Scotchman by birth. He was educated at home in the nursery business; was successively, second in charge of the propagating department of the Royal nurseries at Ascot, England; manager of the nurseries of Martin and Sons of Cottingham, England; manager of a nursery at San Diego, Cal.; and manager of the Wolfskill orange and lemon groves at Los Angeles, for twelve years. In 1890 he was appointed by the State Board of Horticulture of California as state horticultural quarantine officer, with headquarters at San Francisco.

Mr. Craw has for many years made a study of predacious insects and their parasites. He is one of the foremost advocates and exponents of the policy of fighting insects, blights and scales with their natural enemies. It was upon his advice and through his efforts that Prof. A. Koebele was first sent out to seek the enemy of the cottony cushion scale, which was devastating the citrus groves of California, resulting in the discovery and introduction of the *Vedalia cardinalis,* which speedily and completely eradicated the pest in California.

So carefully has Mr. Craw guarded the port of San Francisco, that since his encumbency of the office no new harmful insects have become established in California.

What his presence in Honolulu means to Hawaii can be judged from the fact that Professor Perkins states that practically all of the insects now doing serious injury to agriculture in Hawaii have been introduced here during the last ten years.

Mr. Craw personally meets and inspects every vessel arriving at Honolulu. He has already discovered and destroyed many dangerous insect pests not now in the Territory, thereby preventing their introduction. The Board considers that this branch of its work is of the utmost importance.

Mr. Jacob Kotinsky.

Mr. Jacob Kotinsky, the assistant entomologist, is a graduate of the Agricultural Department of Rutgers College, economic entomology being one of the principal subjects of his study. He later established an agricultural school for boys, teaching natural history and pursuing his entomological studies in the field. In 1899 he was appointed to the Federal Bureau of Entomology at Washington, making a specialty of scale study. He was placed in charge of the breeding and dissemination of an introduced lady bird that feeds upon the "San Jose Scale," a most destructive scale, meeting with such success as to earn promotion in the bureau. Upon the Board seeking an assistant entomologist, Mr. Kotinsky was highly recommended, both by Prof. Koebele and Dr. Howard, chief of the Federal Bureau of Entomology.

Mr. Kotinsky's duties are the care of the office, breeding and distribution of beneficial insects, inspection of existing insect pests, collection and classification of specimens, etc.

Honorary Inspectors at Ports of Entry.

By the kindness of Mr. E. R. Stackable, Collector of Customs at Honolulu, and of the several gentlemen hereunder named, the several Federal Collectors of Customs at the various ports of entry of the Territory have accepted commissions as Honorary Entomological Inspectors, serving as such officers without salary.

The names and jurisdictions of said officers is as follows:

E. A. Frasier, Mahukona, Hawaii.

J. Castle Ridgeway, Hilo, Hawaii.

W. O. Aiken, Kahului, Maui.

W. D. McBryde, Koloa, Kauai.

ENTOMOLOGICAL WORK.

The work of the Division of Entomology involves an immense variety and amount of detail. The two main points around

which and to which all other things have been subordinate are:

First. Inspection and quarantine disinfection or destruction, wherever necessary, of fruits and plants entering the Territory, with a view to prevent the introduction of new insect pests.

Second. Seeking and disseminating parasites of the leaf-hopper.

The loss to the Territory was so great and the field over which damage was being done was so wide that the Board felt that the specializing of efforts to eliminate the leaf-hopper was warranted. Now that the Planters have established an entomological division of their station, this branch of the work of the Board has been relinquished to them.

Third. Considerable has also been done in the way of introducing insect enemies of other predacious insects which are doing injury to other agricultural and stock interests.

The reports of the entomological staff show in detail what has been done in this respect.

Mr. D. L. Van Dine, the Entomologist of the Federal Station, has also done valuable work of an entomological character, in connection with general agriculture.

AGRICULTURE.

In accordance with the proviso in Act 44, the Board has avoided duplicating the work being done by the Federal Experiment Station, and most of the agricultural work coming within the jurisdiction of the Board has been carried on in conjunction with, and through the Federal station.

The two lines of work which at present promise the most immediate beneficial results are in connection with the introduction of the "Bluefields bananas" and the production of a marketable tobacco.

BLUEFIELDS BANANAS.

The Bluefields banana, so-called by reason of Bluefields being the principal port from which this particular kind of banana was first shipped to the United States, has superceded almost every other kind of banana consumed in the United States, except the China variety produced in Hawaii and consumed on the Pacific Coast. It is not quite so delicately flavored as the China or the Jamaica red banana, but it possesses several other qualities which make it by far the best shipping banana that there is, viz:

1. The China banana has a delicate skin, easily bruised, and turns black when bruised. It therefore has to be wrapped in a thick sheathing of leaves and grass, adding greatly to the expense of handling, and nearly doubling the space occupied.

2. The Bluefields banana has a tough skin, not easily bruised and which does not easily discolor. Consequently it does not have to be wrapped.

3. The China banana ripens quickly, becomes spotted, and softens at the stem and drops off the bunch, within a few days after it is ripe.

4. The Bluefields ripens slowly, maintains a clear, golden yellow color, and merely dries at the stem, so that it will last a week or more longer than the China, under like conditions.

5. The China banana projects at right angles from the bunch.

6. The Bluefields slopes upward and backward, along the stem, packing closer and being less liable to injury than the China.

By reason of these several and manifest advantages, numerous private individuals have for many years past attempted to secure Bluefields banana plants for planting in Hawaii; but so jealously do the countries in which this banana grows, guard the export of the plants that the attempt has never been successful.

Through the good offices of Mr. Jared G. Smith, the Federal Agricultural Department at Washington agreed to, at its own expense, despatch a special agent to secure the plants, if the Board would pay the freight. This generous offer was accepted, and in January, 1904, 325 banana stumps were received. Of these 110 survived and grew. These have been propagated at the station, producing 275 shoots; 130 of these have been sent to Hilo, and are being used at the experiment station there, to propagate suckers, while the remainder are being similarly treated in Honolulu.

As soon as enough have been produced to warrant it, the young shoots will be distributed among practical banana growers.

If this experiment results in the successful establishment of the Bluefields banana as an article of export from Hawaii, it will repay the entire expense of this bureau many fold, for, with its superior shipping qualities, it will greatly extend the field which can be supplied from Hawaii, now practically limited to San Francisco and its immediate vicinity.

TOBACCO PRODUCTION.

Many attempts to produce merchantable tobacco, have been made in Hawaii, all resulting, so far, in commercial failure. The reasons for this result are numerous. Among others are undoubtedly the following:

1. The attempts were made by inexperienced men.
2. The experimenters had but little capital, and depended upon immediate success to enable them to go on.
3. The qualities which render a given lot of soil suitable for tobacco, and another in the same vicinity unsuitable, are but little understood, and it is only by practical experiment, more or less costly, that this can be demonstrated.

At the suggestion of Mr. Jared G. Smith, the Board and the Federal Station have jointly borne the expense of a tobacco producing station at Hamakua, Hawaii. Many obstacles and difficulties have been met. The experiment is still being carried on. The results so far achieved, however, are most encouraging. A considerable amount of tobacco, upward of 1,000 pounds, has been harvested and is now being cured. A Havana tobacco of good quality has been produced. Some cigars, made entirely of Hawaiian tobacco, have been rolled, and will be presented to you, as a demonstration of the possibilities of tobacco in Hawaii. It is most earnestly hoped that this experiment may be continued to final demonstration.

Other experiments and plans for the future, are set forth in the report of Mr. Jared G. Smith, Superintendent of the Federal Agricultural Experiment Station, accompanying this report. A full report of the results and details of the tobacco experiment will soon be published, as a special bulletin.

THE FUTURE.

The Board submits herewith a statement of its expenditures up to the 31st of December, 1904, and an estimate of amounts which it deems sound to expend during the coming period. It believes that a much larger amount could be advantageously expended, but in view of the financial condition of the Treasury it has kept its estimates down to the lowest limits, which, in its opinion, will suffice to carry on the necessary work under its jurisdiction.

APPROPRIATIONS FOR BOARD OF AGRICULTURE, HORTICULTURE AND FORESTRY PASSED BY LEGISLATURE OF 1903 FOR THE 6 MONTH'S PERIOD—JULY 1 TO DECEMBER 31, 1903.

SALARIES AND PAY ROLLS.

	Appropriations	Expended	Unexpended
Pay of Superintendent of Forestry	$ 1,500.00	$ 137.10	$ 1,362.90
Assistants, Rangers (to inclue 1 Ranger for Molokai), Employees and Laborers of Division of Forestry	6,000.00	2,568.69	3,431.31
Pay of Superintendent of Entomology	1,500.00	1,500.00	.....
Pay of Assistant Entomologists	2,500.00	2,266.93	233.07
Assistants, Inspectors and Employees of Division of Entomology	1,500.00	628.75	871.25
Pay of Clerk and Messenger	300.00	.....	300.00
Pay of Stenographer and Typewriter	600.00	600.00	.....
Federal Experiment Station—Chemist	500.00	250.00	250.00
Totals	$14,400.00	$ 7,951.47	$ 6,448.53

CURRENT EXPENSES.

	Appropriations	Expended	Unexpended
Incidentals and General Expenses of Board, including importation, collection and propagation of seeds and plants	$ 2,000.00	$ 560.84	$ 1,439.16
Apparatus and Library	250.00	119.37	130.63
Traveling Expenses of Commissioners	125.00	46.50	78.50
Incidentals, General Expenses and Maintenance of Division of Forestry, including fencing, building and tree propagation	5,000.00	3,428.84	1,571.16
Traveling Expenses, Superintendent of Forestry	250.00	186.30	63.70
Incidentals, General Expenses and Maintenance of Division of Entomology, including buildings, disinfecting and quarantine expenses and material, importation, propagation and distribution of beneficial insects, and Traveling Expenses of Entomologists	2,500.00	2,065.07	434.93
Farmers' Institute	75.00	.....	75.00
Agricultural and Horticultural Fairs	1,250.00	.....	1,250.00
Assistance to Federal Experiment Station at Honolulu, to be expended under the direction of the Board	2,500.00	1,914.59	585.41
Totals	$13,950.00	$ 8,321.51	$ 5,628.49

APPROPRIATIONS FOR BOARD OF AGRICULTURE, HORTICULTURE AND FORESTRY PASSED BY LEGISLATURE OF 1903 FOR THE 18 MONTH'S PERIOD, (AMENDED AT THE SPECIAL SESSION OF 1904 TO 6 MONTHS,) JAN. 1 TO JUNE 30, 1904.

SALARIES AND PAY ROLLS.

	Appropriations	Expended	Unexpended
Salary of Superintendent of Forestry	$ 4,500.00	$ 1,500.00	$ 3,000.00
Assistants, Laborers and Rangers, Division of Forestry	15,000.00	2,172.92	12,843.75
Salary of Superintendent of Entomology	4,500.00	1,500.00	3,000.00
Pay of Assistant Entomologists	7,500.00	2,150.00	5,350.00
Pay of Assistants, Inspectors and Employees, Division of Entomology	4,500.00	989.00	3,511.00
Pay of Clerk and Messenger	900.00	300.00	600.00
Federal Experiment Station—Chemist	1,500.00	500.00	1,000.00
Totals	$38,400.00	$ 9,111.92	$29,304.75

CURRENT EXPENSES.

	Appropriations	Expended	Unexpended
Incidentals and General Expenses of Board, including importation, collection and distribution of seeds and plants	$ 6,000.00	$ 1,460.89	$4,539.11
Apparatus and Library	750.00	166.94	583.06
Traveling Expenses of Commissioners	375.00	.....	375.00
Incidentals, General Expenses and Maintenance of Division of Forestry, including buildings, fencing and tree propagation	15,000.00	569.75	14,430.25
Traveling Expenses, Superintendent of Forestry	750.00	135.40	614.60
Incidentals, General Expenses and Maintenance of Division of Entomology, including buildings, disinfecting and quarantine expenses and material, importation, propagation and distribution of beneficial insects, and traveling expenses of Entomologists	7,500.00	785.26	6,714.74
Agricultural and Horticultural Fairs	3,500.00	.....	3,500.00
Farmers' Institute	225.00	60.80	164.20
Assistance to Federal Experiment Station at Honolulu	7,500.00	1,016.70	6,483.30
Totals	$41,600.00	$ 4,195.74	$37,404.26

APPROPRIATIONS FOR BOARD OF AGRICULTURE, HORTICULTURE AND FORESTRY PASSED BY THE LEGISLATURE OF 1904, AT THE SPECIAL SESSION, FOR THE FIRST 6 MONTHS OF THE 12 MONTH'S PERIOD, JULY 1, 1904, TO JUNE 30, 1905. JULY 1 TO DEC. 31, 1904.

SALARIES AND PAY ROLLS.

	Appropriations	Expended	Balance on hand
Salary of Superintendent of Forestry ($250.00)	$ 3,000.00	$ 1,500.00	$ 1,500.00
Pay of Assistants, Laborers and Rangers Division of Forestry	2,700.00	1,342.00	1,358.00
Salary of Superintendent of Entomology ($250.00)	3,000.00	1,451.61	1,548.39
Pay of Assistants, Inspectors and Employees, Division of Entomology	7,280.00	3,415.20	3,864.80
Salary of Clerk and Stenographer	900.00	450.00	450.00
Totals	$16,880.00	$ 8,158.81	$ 8,721.19

CURRENT EXPENSES.

	Appropriation	Expended	Balance on hand
Incidentals and General Expenses	$11,780.00	($2,294.93) Liabilities (2,612.73)	
		$ 4,907.66	$ 6,872.34

	Appropriation	Expended	Balance on hand
Assistance to Federal Experiment Station	$ 2,736.00	$ 1,509.32	$ 1,226.68

ESTIMATE OF APPROPRIATIONS FOR THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY FOR THE BIENNIAL PERIOD, JULY 1, 1905, TO JUNE 30, 1907.

(As amended and submitted by Finance Committee to Board of Commissioners of Agriculture and Forestry, Jan. 31st, 1905.)

DIVISION OF ENTOMOLOGY.

SALARIES AND PAY ROLLS.

	Per annum	Per period
Superintendent of Entomology and Inspector	$ 3,000.00	$ 6,000.00
Consulting Entomologist	3,000.00	6,000.00
First Assistant Entomologist	2,100.00	4,200.00
Second Assistant Entomologist	1,200.00	2,400.00
Inspector's Assistant (Division of Entomology)	1,500.00	3,000.00
Clerk and Stenographer (Division of Entomology)	900.00	1,800.00
One-half (Forestry the other half) janitor, driver	300.00	600.00
One-half (" " " ") yard worker	180.00	360.00
One-half (" " " ") general clerk	300.00	600.00
Totals	$12,480.00	$24,960.00

CURRENT EXPENSES.

	Per annum	Per period
Apparatus and laboratory supplies	$ 500.00	$ 1,000.00
Books and periodicals	500.00	1,000.00
Freights	150.00	300.00
Totals	$ 1,150.00	$ 2,300.00

RECAPITULATION.

	Per annum	Per period
Division of Entomology—		
Salaries and Pay Rolls	$12,480.00	$24,960.00
Current Expenses	1,150.00	2,300.00
Totals	$13,630.00	$27,260.00

DIVISION OF FORESTRY.

SALARIES AND PAY ROLLS.

	Per annum	Per period
Salary of Superintendent of Forestry ($250)	$ 3,000.00	$ 6,000.00
Assistants, Rangers, Employees and Laborers	13,720.00	27,440.00
Pay of Field Foreman ($150.00) $ 1,800.00		
" " two Laborers at Nursery ($30 each) 720.00		
" " two Laborers at Nuuanu ($30 each) 720.00		
" " six Forest Rangers ($100 each) 7,200.00		
" " Laborers to be temporarily employed in planting Nuuanu and Tantalus forests and in other reserves, etc. 2,500.00		
" " Wagon Driver and Janitor man and wife, one-half of $50.00 per month (other half to be paid by Division of Entomology) 300.00		
" " Yardman on Nursery grounds one-half of $30.00 per month (other half to be paid by Division of Entomology) 180.00		
" " Clerk and Messenger at $50.00 per month (other half to be paid by Division of Entomology) 300.00		
	$13,720.00	
Pay of Stenographer, Division of Forestry ($100.00)	1,200.00	2,400.00
Totals	$17,920.00	$35,840.00

CURRENT EXPENSES.

	Per annum	Per period
Incidentals and General Expenses of Division of Forestry, including maintenance of Nursery and the marking of forest reserve boundaries with permanent monuments	$ 3,350.00	$ 6,700.00
Maintenance of Nursery— Per an.		
Tools, boxes, pots, freights, etc. $ 250		
Horse shoeing, feed, repairs to harness, wagon, etc. 350		
Forestry books and publications 750		
Forest reserve boundary monuments, including labor in setting same 2,000		
	$3,350	
Fencing of forest reserve boundaries where unavoidable	2,000.00	4,000.00
Totals	$ 5,350.00	$10,700.00

RECAPITULATION.

	Per annum	Per period
Division of Forestry—		
Salaries and Pay Rolls	$17,920.00	$35,840.00
Current Expenses	5,350.00	10,700.00
Totals	$23,270.00	$46,540.00

BOARD OF AGRICULTURE AND FORESTRY.

CURRENT EXPENSES OF THE BOARD.

		Per annum	Per period
Incidentals and General Expenses of Board		$ 6,700.00	$13,400.00
Including—			
(1) The printing of By Authority and other notices and regulations, reports, "Hawaiian Forester and Agriculturist," bulletins and circulars of the Divisions of Forestry and Entomology, etc.	$ 1,750		
(2) Importation, collection, propagation and setting out of seeds and plants.	1,500		
(3) Division and Board incidentals, postage, general office supplies and traveling expenses of Commissioners and of Division Superintendents and Assistants, viz:	3,450		
	Per an.		
Incidentals, etc., Board	1,200		
Travelling expenses Board	150		
Incidentals, stationiery, etc., Forestry	500		
Incidentals, stationery, etc., Entomology	500		
Traveling expenses, Forestry	600		
Traveling expenses, Entomology	500		
	$3,450		
Library (books on Agriculture and special industries)		400.00	800.00
Totals		$ 7,100.00	$14,200.00

FEDERAL EXPERIMENT STATION.

	Per annum	Per period
Assistance to Federal Experiment Station, expenditures to be subject to supervision of the Board of Commissioners of Agriculture and Forestry, for introduction of new agricultural industries and agricultural experiments, other than with sugar cane	$10,000.00	$20,000.00

GENERAL RECAPITULATION.

	Per annum	Per period
Division of Entomology—		
Salaries and Pay Rolls	$12,480.00	$24,960.00
Current Expenses	1,150.00	2,300.00
Division of Forestry—		
Salaries and Pay Rolls	17,920.00	35,840.00
Current Expenses	5,350.00	10,700.00
Board—		
Current Expenses	7,100.00	14,200.00
Assistance to Federal Experiment Station	10,000.00	20,000.00
Totals	$54,000.00	$108.000.00

LORRIN A. THURSTON,
W. M. GIFFARD,
JAMES D. DOLE,
C. S. HOLLOWAY,
A. W. CARTER,
J. F. BROWN,

FORESTRY.

REPORT OF THE DIVISION OF FORESTRY.

BY

RALPH S. HOSMER,

SUPERINTENDENT OF FORESTRY.

HONOLULU, T. H., December 31, 1904.

THE BOARD OF COMMISSIONERS OF
AGRICULTURE AND FORESTRY,
Honolulu, T. H.

GENTLEMEN:—I have the honor to submit herewith the report of the Division of Forestry for the period from July 1, 1903, to December 31, 1904, with certain other matters bearing on forestry in the Territory.

The most notable features of the forestry work done by the Board from the passage of Act 44, which was approved April 25, 1903, up to the close of the year 1903, were the organization of the Board itself, the appointment of the local, unpaid, district foresters, for the several districts throughout the Territory,* the visit of Mr. William L. Hall, Chief of the Division of Forest Extension, U. S. Bureau of Forestry, and the appointment of the Superintendent of Forestry.

FORESTER HALL'S VISIT.

Soon after the members of the Board were commissioned by Governor Dole, correspondence began with Mr. Gifford Pinchot, Forester of the United States Department of Agriculture, in reference to the appointment of a Superintendent of Forestry. To obtain accurate information upon which to act, Mr. Pinchot sent Mr. Hall to investigate and report upon the forest conditions and needs of the Territory. Mr. Hall's visit covered a period

*The names of the gentlemen who serve in this capacity are given at the end of this report.

of three months. During that time he visited all the leading islands in the group and got in close touch with the forest problems throughout the Territory. As a result of his visit there was published, early in 1904, by the U. S. Bureau of Forestry, a bulletin by Mr. Hall, entitled "The Forests of the Hawaiian Islands."

APPOINTMENT OF SUPERINTENDENT OF FORESTRY.

Based upon the suggestions of Mr. Hall, Mr. Pinchot, in November, 1903, recommended my appointment as Superintendent of Forestry, I being at that time a member of the U. S. Bureau of Forestry. Acting on this recommendation, I was appointed by the Board, as Superintendent of Forestry, at the meeting held on November 25th, 1903; the appointment taking effect December 15, 1903. I arrived in Honolulu on January 13, 1904, and began active work at once.

WORK OF THE SUPERINTENDENT OF FORESTRY DURING THE YEAR.

Coming to a new field the first step was, naturally, to get acquainted with local conditions. In this regard I have been exceptionally fortunate, having been invited by Governor Carter to accompany his party on the tours made by him to Hawaii, Kauai and Maui. On these trips an excellent opportunity was offered not only to secure a comprehensive general idea of the distribution and extent of the existing forest, but also to meet, under the most favorable auspices, the leading men throughout the Territory, on whose cooperation in the future the success of much of the forestry work depends.

The trip to Hawaii followed almost immediately upon my arrival in Honolulu and lasted for five weeks. That to Kauai came in May, covering eight days; while the one to Maui, in September, occupied a little more than a fortnight. The especial value of such general trips as these, preliminary to detailed investigations of given areas, was that they provided the means of obtaining a comprehensive knowledge of the forest conditions throughout the Territory; of the relative importance of the forest in different situations and localities; and of the various aspects of the many questions which must be considered in making a systematic and logical plan to cover the whole Territory.

Following my initial visit to Hawaii came a period of work in the office. Fortunately the new building of the Board, in the Government Nursery grounds, was completed in February so that no time was lost in getting the Division of Forestry established in its permanent home. Office furniture and equipment were purchased, collections of books and maps systematized or started, and the routine work of the office got under way in a business like manner. At this time, too, changes were made in the management of the Nursery and the Nuuanu Forest Station, which are discussed later in this report.

Short trips to a number of points on Oahu in March and April, notably in the Koolauloa and Ewa Districts, were followed in May and June by detailed examinations of the districts of North Kona and South Kohala on Hawaii; Halelea, Koolau and Puna on Kauai, and a visit to the Island of Lanai.

The greater part of July was taken up with a visit to the Hilo District, Hawaii, at which time a careful examination of the question of the proposed Hilo forest reserve was undertaken, and the location of the lower boundary determined. During August the central and south parts of Kona, Hawaii, were visited and at the end of the month the upper line of the proposed Hilo Reserve was settled upon.

In September came the trip to Maui, with Governor Carter, already mentioned. Most of October was spent in the office in the preparation of reports and the working up of notes. In November another trip was made to Maui, this time to investigate in detail the great forest reserve proposed for the Hamakuapoko, Hamakualoa and Koolau Districts.

December has been a month of reports and office work, save for one week when a short trip to Kau, Hawaii, was made to inspect some land belonging to the Bishop Estate, where it is proposed to lumber the mature Koa. This last visit was made in accordance with the offer of the Division of Forestry to give advice and assistance to owners of forest land, or others, desiring to handle their forests according to forestry methods.

REDUCTION OF APPROPRIATION.

In the retrenchment of government appropriations which became necessary in the spring of 1904, to put the Territory on

a business basis, the appropriation for the Board of Agriculture and Forestry was heavily cut.

In the original appropriation for the eighteen months period, ending June 30, 1905, the Division of Forestry's portion was $35,625. On a pro rata basis, the amount for the twelve months ending June 30, 1905, would have been $23,750.

At the Special Session of the Legislature the amount appropriated for the Division of Forestry, for the twelve months period ending June 30, 1905, was $9,810. This is forty-one per cent. of the original amount.

The work of the Division of Forestry, was of course hampered in a number of ways by this reduction of funds, but owing to the fact that a large part of the cut fell on the money alloted for the pay of forest rangers, who had not been appointed, the reduction did not prove the serious set back to the forestry work which it might have been had the forest ranger system been well under way. It may therefore be regarded as fortunate that the cut was made when it was.

ACKNOWLEDGMENTS.

Before passing to the consideration in detail of the forest problems which await solution, I wish to acknowledge my indebtedness to the various persons throughout the Territory who have extended to me the most cordial hospitality and given me assistance in many and varied ways.

To attempt to mention names would swell this report to the dimensions of a directory of the islands. I can therefore only say that my appreciation is sincere and my thanks most hearty.

REPORT AND RECOMMENDATIONS BY DISTRICTS.

Based upon the field work described above I have to report as follows upon the several districts on the different islands in the group. Some districts must necessarily be passed over with brief mention because in less than a year it is physically impossible for one man to cover, except in a general way, so large an area as this Territory embraces. If therefore, some sections do not seem to be done full justice, it must be put down, not to a lack of desire on my part, but to the force of circumstances.

Frequent references will be made to the reports of the district foresters, These will be found as an appendix to this report in the latter part of this publication.

KAUAI.

Taken as a whole the forest problems on Kauai are simple ones. In the center of the island rises the mountain mass of Waialeale to an elevation of 5,240 feet. From its summit radiate a number of great spurs or ridges, all densely wooded to the top. In the valleys between flow streams which are of great importance, actual or potential, for the development of power and for irrigation.

In maintaining a constant and moderately even flow in these streams, the forest plays an important part, particularly as the value of the water for developing the agricultural land below is far greater than the returns would be from any other use to which the steep slopes from which it comes, could be put. A further reason why it is especially important that the forest on Kauai be preserved, is that with the necessarily small water-shed it is essential that all the water that can be impounded be made available for use.

The grazing interests on Kauai, save in one district, are not as important as elsewhere in the Territory, being largely subordinate to, and controlled by, the sugar plantations.

The question then, becomes one of reserving the forest above the point where the land can be profitably used for agriculture and for the necessary grazing.

Halelea.

The dominant characteristic of the forested portion of this district is its steep and rugged topography. High mountain ridges with precipitous slopes, alternate with deeply cut valleys, in which flow torrential streams, fed by the heavy and nearly constant rainfall on the slopes above. The rapid fall of the rivers makes the region one where great power could be developed, while there is also the possibility of making available some at least of the water for irrigation.

It is proposed that a forest reserve be established to include

the more rugged portions of this section, the lower boundary being drawn along the base of the steep slope. This lower boundary starts at the Na Pali District line and runs across the Wainiha, Lumahai, Waipa, Waioli, Hanalei, Kalihikai and Kalihiwai valleys, at about the edge of the existing forest, which is practically where the steep slope begins. The upper boundary of the reserve is the crest of the ridges. All good grazing and agricultural land is thus excluded.

Arrangements are now under way whereby certain of the privately owned lands lying within the limits of this forest reserve will be turned over to the Government for management, so that with the Government lands, the reserve will include a large area.

Koolau.

The existing forest in the Koolau District is practically confined to the steep slopes of the Koolau ridge. Below, on the gently sloping lands nearer the Government road, the original forest has almost disappeared, so that the forest problem presented is largely one of reforestation. If certain parts of this district were under a forest cover there is little doubt that the water there conserved would be of greater value than the returns now got from the use of the land for grazing. But as the Kilauea Plantation would be the one primarily benefitted by such reforestation, it is natural to look to that company to take the first and most active steps in whatever may be done.

In this connection attention is called to the report of the District Forester, Mr. Andrew Moore, which will be found elsewhere in this publication.

Puna.

In the Puna District, the forest on the mountain is important for the reasons already stated for the other districts; that it protects the water-sheds and helps to maintain a uniform flow of the streams. Its value on this account is well understood by both the Lihue Plantation and the Makee Sugar Companies, the two corporations controlling the greater part of the better land in this district.

The Makee Sugar Company has signified its willingness to cooperate with the Government in the establishment of a forest

reserve to include both government and private land. It is expected that this matter will be brought to a head in the spring of 1905, at which time the leases on certain government lands now held by that plantation, come within two years of the time when they expire.

The Lihue Plantation Company has had under fence since 1894 a considerable area of the forest land back of the plantation. Stock have been excluded and as a result a dense stand of Ohia Lehua (*Metrosideros polymorpha*) has sprung up. Beside the reservation of the native forest, the Lihue Plantation Company has also done much in the way of planting forest trees. Following the example of the Honorable G. N. Wilcox, who has for many years taken a deep interest in tree culture, the Lihue Plantation Company has planted since 1882 about 1,000 acres. The trees used have been principally Ironwood (*Casuarina equisetifolia*), Blue Gum (*Eucalyptus globulus*) and Koa, both the native and Australia species, (*Acacia koa* and *Acacia melanoxylon*). The idea of these forest plantations is to furnish a supply of fire-wood and to create a forest cover to retain the rainfall on areas where the soil is poor in quality. On fulfilling these requirements the plantations have been an eminent success. An annual supply of some 250 cords of fire-wood has been obtained, while from the planted area a stream of almost a million gallons of water a day has been developed.

Further details of this interesting work are given in the report of Mr. F. Weber, the District Forester, which appears later in these pages. A report from Mr. G. H. Fairchild is also published.

The forest reserve in this district should, when completed, include the land above a line drawn from the Anahola River along the lower edge of the existing forest, until it connects with the private reserve already set apart by the Lihue Plantation Company. Above this line the government land should be set apart and the private land turned over to the Government, under the terms of Act 44.

Kona.

In view of the large irrigation works in this part of the island, the proposed Kona forest reserve is one of no small importance.

A start toward it has been made by the McBryde Sugar Company in fencing off some of their upper lands. Messrs. Gay and Robinson have also excluded cattle from the forest on certain of their lands. But to accomplish the desired result the fences should be extended until all the land properly to be classed as forest is included.

In this connection attention is called to the report of Rev. J. M. Lydgate, the District Forester.

In his report as District Forester for Waimea, Mr. Francis Gay makes note of the Algaroba forest (*Prosopis juliflora*) which has spread over the low lying lands in this section from the trees planted in the early eighties. His report should be read in this connection.

As I have only seen the Kona and Waimea Districts during the quick trip made with Governor Carter, when there was no opportunity to get into the forests, I have at this time only the above general recommendation to make. But the section is one which ought to be examined carefully and reported upon in detail. I hope to take it up during the coming year.

Waimea and Na Pali.

Greatly to my regret I have twice been obliged, by the press of work elsewhere in the Territory, to decline invitations from Mr. Augustus Knudsen to visit and inspect the Waimea District. Mr. Knudsen says that "in protecting part of our own ranch, Knudsen Brothers, have protected some fifteen or twenty square miles of Government land in the District of Na Pali, namely the upland of Kalalau," and suggests that a good deal more might be accomplished with comparatively little effort. Taken as a whole the Na Pali District has perhaps the most rugged topography of any part of the Territory. It is an almost uninhabited and a practically unexplored country.

It is evident that a considerable portion of the great stretch of swampy upland, in which the Waimea River heads, ought to be reserved, because of the importance of this stream below.

This section is also one which ought to be investigated. I trust to be able to take it up in the coming months.

The Island of Niihau has not yet been visited, so no recommendations can be given for it.

OAHU.

Ewa and Waialua.

On Oahu there are two sections which should as soon as possible be set apart as forest reserves, viz: the western slope of the Koolau Mountains and the upper portion of the Waianae Hills. The former is the more important because on it depends, in no small measure, the water supply of the large and highly productive Ewa and Waialua Basins, with their great agricultural possibilities.

Owing to the barrier reef of coral and the clay stratum that with it makes an impervious wall on the south side of Oahu, the ground-water is held back on its way to the sea and furnishes a constant and unfailing supply to the various pumps and wells throughout the Ewa section. But if the forest now clothing the upper slopes were removed, much of the water which at present finds its way by the underground channels, slowly to the sea, would rush down in a few hours in floods and torrents, not only escaping its duty for irrigation and other uses but also endangering property along its course.

On the Waialua side the development of water through an elaborate irrigation system makes essential the conservation of all the streams which feed the flumes and ditches.

The exact location of the lower boundary of the proposed reserve has not yet been determined but it should follow approximately the lower edge of the existing forest on the Koolau Mountains, and on the Waianae Hills should include the greater part of the steep slopes.

A private forest reserve of some twenty thousand acres is now maintained on the Bishop Estate lands on the western slope of the Koolau ridge; fences having been built and cattle excluded for a number of years. This area forms a part of the land proposed to be reserved.

Mention should be made here of the experimental forest plantation of the Oahu Railway and Land Company at the southern end of the Waianae Ridge. It covers a number of acres and should yield valuable information in regard to the kinds of trees which will do best in this section. The object of the Railway Company is to find a hardy and quick growing tree, from which ties and other railroad timbers can later be cut.

In this connection the reports of Messrs. W. F. Dillingham and A. M. Nowell, the District Foresters for the Ewa and Waialua Districts, respectively, should be read. They will be found on a later page of this report.

Waianae.

The notable feature of this district from a forest standpoint is the dense stand of Algaroba extending all along the coast at the lower elevations. Because of its varied uses this forest is a valuable asset to the District.

No detailed examination has yet been made of the Waianae District, consequently no definite recommendations can here be made, except for the land of Waianae Uka. Portions of this tract ought unquestionably to be reserved, as forming part of the Waialua Basin, already discussed.

An examination of the native forest on the slopes above Waianae is one of the things which now await to be taken up.

Koolauloa.

The forest problem in this district is to protect the water sheds of the valleys at the northwestern end of the Koolau ridge, from which water may be developed and on which the supply of artesian wells of the district in the end depends.

One tract of government land on the eastern slope has already been set apart, as a forest reserve. This land, Kaipapau, enjoys the distinction of being the first forest reserve created under the present law. It was set apart by a proclamation signed by Governor Carter, on November 10th, 1904. The area is nine hundred and thirteen acres.

A preliminary examination has been made of the adjoining lands to the west and the District Forester, Mr. Andrew Adams, informs me that arrangements are under way, which will result in the reservation of a considerable additional area of private land now covered with native forest.

Koolaupoko.

On the windward side of the Koolau Ridge the forest is in good part protected by the character of the topography; the

slopes rising so abruptly and precipitously, that little harm can come to the forest on them. A preliminary examination has been made of the eastern end of the district but data on which to base recommendations for the district as a whole are not yet in hand.

At the Maunawili Ranch a considerable area has been planted with forest and other trees. For the details of the interesting work done here, the report of Mr. John Herd, the District Forester for the south end of the Koolaupoko District, should be read. Those of Messrs. C. Bolte and L. L. McCandless, the District Foresters for the middle and for the north end of the district should also be consulted as a part of the report on this section.

Kona.

The steep slopes at the heads of the valleys near Honolulu, running up to the back bone of the Koolau ridge, ought eventually to be set apart and declared forest reserves but as they are protected because of their steepness and inaccessibility this section is not in immediate need of attention. In this connection attention is called to the report of Hon. D. P. R. Isenberg, the District Forester.

MOLOKAI.

The native forest on Molokai is found at the east end of the island, at the higher elevations and along the precipitous palis on the windward side. That in the central portion and at the eastern end is in part protected from cattle by fences built and maintained by the Molokai Ranch Company. Between eight and ten thousand acres are enclosed—but not all of this is under forest cover.

On the leeward side of the island the Algaroba forest is spreading rapidly, both by extending along the shore and also by climbing up the slope—where it is now found as high as eighteen hundred or two thousand feet. The importance of a tree which forms such stands, and has so many uses as the Algaroba can hardly be overestimated.

Molokai is the only large island in the group which I have not

yet visited. Definite recommendations can therefore not be given here. The report of Mr. G. C. Munro, the District Forester for Molokai, should be read in this connection.

LANAI.

The forest problem on Lanai is essentially one of protecting the remaining native forests against the destructive ravages of the goats, which now run wild in large numbers, over the rougher and higher parts of the island.

The great lack on Lanai is water. Were the water-sheds on the mountain covered more completely with forest than they are now, a larger water supply could be developed. For this reason I have recommended that the upper portion of mountain, which occupies the center of the island, be reserved and fenced off, and the wild goats systematically and thoroughly hunted down and exterminated.

The entire island is controlled, through direct ownership or through lease, by Mr. Charles Gay, who uses it as a cattle and sheep ranch. As he would be the one primarily benefited by the proposed forest reserve, it is only fair to look to him for liberal assistance in whatever work is undertaken. That a start ought to be made speedily there is no question, for the destructive erosion of the mountain caused by the goats, is becoming more and more serious every month that it is allowed to go on.

It is hoped that the coming year may see something accomplished.

KAHOOLAWE.

Kahoolawe is said, in former times, to have been covered with forest. At present it is a bleak and wind-swept spot, from which the scant vegetation cannot prevent a constant cloud of sand and dust from being blown away to sea. It is used as a sheep ranch. Algaroba has made a good start along the beach and is spreading inland. Experiments with various trees, grasses and shrubs are being made by Mr. Christian C. Conradt, the lessee of the island.

MAUI.

Maui is in some ways the most interesting island of the group from the forester's standpoint; for no where else in the Territory is the influence of the forest so well understood and its relation to the welfare of the community so clearly manifest.

The great Wailuku Plain, made fertile to a remarkable degree by irrigation, is the strongest sort of an argument for the safeguarding of the forests, from which comes the water that makes irrigation possible.

Hamakuapoko, Hamakualoa and Koolau.

So alive to the importance of the forest for this purpose are the men controlling the agricultural land, that practically all of the forest land in the Districts of Hamakuapoko, Hamakualoa and Koolau, both public and private, is by arrangement with the Government, to be set apart as a great forest reserve.

Upon the government lands being reserved, the "Baldwin Interests" will turn over their forest lands as well, so that the reserve will be administered as a united and organic whole.

The details of this negotiation are well in hand and by the time this report is published the reserve will probably be proclaimed. The proposed reserve will include the bulk of the existing forest on the windward side of the island and will be one of the largest and most important in the whole Territory.

For a number of years portions of the proposed reserve have been maintained under fence as private reserves and cattle excluded from them.

Furthermore the Baldwin Interests have recently built long stretches of a forest fence along the lower edge of the forest in the Koolau District, on land which is leased from the Government, either as a whole or for the water rights only. This fence will, much of the way, be the lower boundary of the proposed forest reserve.

The public spirit and far sighted interest in the welfare of the Territory shown by Mr. H. P. Baldwin in his dealings with the Government in these matters deserve the highest commendation. The Territory is in need of more men like him.

Hana, Kipahulu and Kaupo.

The necessity for forest protection also exists in these districts and later it will be advisable to extend the Koolau reserve along the Coast, or rather, make other reserves in these districts.

As yet I have only visited this section on a preliminary trip so that no definite recommendations can be given here as to what ought to be done.

Kahikinui.

The forest problems in Kahikinui are largely those of reforestation and as such must necessarily wait till the reserve policy of the Government is well established and on its feet. The district is more recent geologically than the remainder of Maui and in consequence contains much waste and barren land.

Kula.

On the southwest slope of Mt. Haleakala is a section which in former years was densely wooded but from which the forest has now almost wholly disappeared.

This area extends from the upper edge of the corn belt, up to the top of the long ridge that divides Kula and Kahikinui. From the evidence obtainable there is good reason to believe that were this area again in forest, conditions in the Kula district would be bettered in a number of ways. The problem presented is one well worth thorough investigation, and should be given careful and detailed study on the ground. As such a study has not yet been made, definite recommendations cannot be given here.

Tree Planting by H. P. Baldwin.

No forest description of East Maui, be it ever so brief,, would be complete without some mention of the forest plantations which have been made under the direction of Mr. H. P. Baldwin and of other members of the Baldwin family. For many years systematic planting has been carried on on a large scale, with the result that a considerable acreage is now covered with forest. A great variety of trees have been experimentd with and many

valuable facts found out in regard to the kinds of trees best suited to the local conditions and to the methods which should be pursued to get the best results. It is hoped that in the near future these data can be compiled by the Division of Forestry, in cooperation with Mr. Baldwin, and made available for reference.

Plantations have also been made by the Maui Agricultural Company and the Haleakala Ranch Company, which deserve more space than can here be given them.

These forest plantations, with those of the Lihue Plantation Company, on Kauai, stand out as the leading examples of privately established forests in the Territory. They are examples which other companies would do well to imitate.

In his report as District Forester of Makawao, Mr. L. von Tempsky gives much interesting information in regard to this and other forestry work undertaken in his district. His report should be read in this connection, as should also that of Mr. H. A. Baldwin for his district.

West Maui.

The West Maui Mountain is another section where there is need of forest reservation, as from this section, also, water is being developed for irrigation.

The Pioneer Mill Company has fenced off as a private forest reserve, the area on the Lahaina watershed, above the two thousand-foot contour line. Since cattle have been kept out the cover of vegetation has noticeably increased and demonstrated the effectiveness of the reserve. In this connection attention is called to the report of the District Forester for Lahaina, Mr. L. Barkhausen.

On the eastern slope of the West Maui Mountain the Wailuku Sugar Company anticipates doing work of a similar character, but as yet no active steps have been taken. This section is one which I have in mind to visit at an early date, to get in touch with the conditions on the ground and to make recommendations as to the forest areas which should be reserved.

HAWAII.

The wide range of conditions on the Island of Hawaii gives rise to a variety of forest problems which can be best considered by individual districts.

Kohala.

Nowhere in the Territory is there more pressing need of forest reservation than in this district, for on the forest area on the Kohala Mountain depends the chief water supply of the north end of the island. To insure its permanence this forest ought to be reserved at once.

The Kohala Reserve should include practically all of the existing forest on the south and west sides of the Kohala Mountain, and also a section above the plantations on the windward side of the district, as a water supply is needed both for the agricultural lands near the sea and for the development of the Waimea Plains, which might be made a region of farming lands and of diversified industries. Within the last few years land on and adjacent to the Kohala Mountain has been opened, in which cattle ought never to have been allowed. Unless these areas are reclaimed speedily it will be too late, for the forest is fast disappearing.

Various causes have operated to prevent forest reservation; the latest being the litigation now going on over the control of the Parker Ranch. But for this a considerable area of the Kohala Mountain would without doubt, by now have been a forest reserve.

Negotiations are now in progress with the owners of lands other than those controlled by the Parker Ranch, which ought to be reserved as forest and the whole matter will be steadily pushed and every effort made to establish the reserve.

Mention ought to be made in connection with this district of the spread of the Algaroba along the leeward coast from Mahukona to Puako. Within a few years there will be a dense stand of this valuable tree along this stretch of shore.

Considerable work had been done in the Kohala District in the way of establishing forest plantations and in experimenting with trees which are believed to be adapted to different situations and elevations. In this work Dr. B. D. Bond, Mr. E. E. Olding, Manager of the Kohala Sugar Company, and the Parker Ranch have taken the most active interest.

For the details of this work and other forestry matters the reports of the District Foresters for Kohala, Messrs. E. E. Olding and F. W. Carter, should be read.

North Hamakua.

The north end of the Hamakua District, between the Kohala District line and the Waipio gulch, an area of seventeen thousand acres, was set apart by Governor Carter as a forest reserve on December 23rd, 1904. The object of this reserve is to protect the watersheds of the streams rising in this section, the water and power from which are soon to be developed. Some additional lands now under private ownership ought also to be included in this reserve, as well as the adjoining section in Kohala. Negotiations looking to this end are now under way with the owners of these lands.

South Hamakua.

The forest above the agricultural land in the south end of this district has, through one cause and another, been gradually pushed further and further back up the mountain, and down from the upper side, until a point has been reached where any additional clearing will materially affect the already uncertain and intermittent streams; for in this end of Hamakua none of the streams run permanently. The question of an ample water supply is therefore a serious one.

As no detailed study of Hamakua has yet been made by me, recommendations cannot be given here. But there is no question in my mind that a belt of forest above the plantations ought to be reserved. A start toward this has been made in the tract of forest land above Kukuihaele now held as a private reserve. An examination of the South Hamakua District will be made in the near future, which it is expected will lead in the end to tangible results in the creation of a forest reserve.

For almost twenty years tree planting has been going on in Hamakua, with the result that there are now considerable areas covered with artificially established forest, as well as many miles of wind breaks and rows of shade trees along the roads and on the several plantations.

Much of this work has been done at the instance or following the example of Mr. David Forbes, the District Forester. In his report will be found many pertinent observations on the kind of trees which have been found to do well in his district, with other matters of interest concerning forest matters.

Hilo.

A carefully worked out plan for a forest reserve has been prepared for the Hilo District, including the area between the Hamakua District line and the 1855 and 1881 Lava Flows, back of Hilo town. The lower limit of this proposed reserve is at an elevation of approximately seventeen hundred and fifty feet and its upper edge is along the upper edge of the Koa and Ohia forest, at an elevation of about six thousand feet. An accurate map on a large scale showing the lower boundary has been prepared for the Board by Mr. A. B. Loebenstein of Hilo. Another map of the upper boundary is almost ready. Upon its completion the matter will be brought up to the Governor with the request that the government forest lands within the boundaries of the reserve be set apart. A large percentage of the land within the proposed reserve is owned by private interests, and some of it is now held as private forest reserves. Negotiations are under way whereby these lands may, under the law, be included in the proposed reserve.

It is hoped that in the future considerable work may be done toward the afforestation, with timber trees from the temperate zone, of the high lying slopes of Mauna Kea, above the level of the good grazing land. Experiments to that end are now being made, which it is expected will yield valuable data for future work.

South Hilo and Puna.

The sudden change of conditions found on crossing to the East of the 1881 Lava Flow renders the forest problems of South Hilo and of Puna of less immediate importance than those in the North end of the Hilo District.

South Hilo is a district of heavy rainfall but the porosity of rock and soil makes running streams out of the question and as there is no barrier reef along the Puna Coast, to hold back the ground water and supply artesian wells, this necessity for protecting the watersheds does not exist. At the same time the rough and rocky character of the land makes much of it suitable only for forest. No detailed examinations have yet been made in either of these districts, consequently no recommendations are given here. But it is believed that there are certain areas, which

being chiefly valuable because they can be made to produce trees of commercial importance, ought to be used by the Government for this purpose.

The forest question in these districts is essentially one of the commercial value of the forest products. If it can be shown that for certain tracts the best crop is trees, then the land should be so used.

Attention is here called to the report of the District Forester, Mr. John Watt.

Kau.

East Kau.

In parts of Kau, especially at the eastern end of the district, the same conditions obtain as in Puna. The porous character of the soil makes permanent streams impossible and watershed protection unnecessary. The commercial aspect of the forest therefore becomes the dominant feature, and as there are in this section considerable areas covered with the most valuable Hawaiian wood, Koa, it becomes a business proposition of how to make this asset a tangible one. The policy of logging the mature and merchantable trees of commercially valuable species is good sense and good forestry; provided the work is done with due regard for the young trees that are to make the succeeding stand. To cut the mature trees in such a way as to insure the permanence of the forest is indeed the keynote of forestry. In the epigram of President Roosevelt, "Forestry is the preservation of forests by wise use."

The Division of Forestry is now cooperating with the Bishop Estate in preparing plans whereby a section of Koa forest of the above character may be lumbered in accordance with forestry methods. These plans if put into effect will mark the beginning of practical forestry in the utilization of the Hawaiian forests.

In considering this district it may be noted that the Bishop Estate maintain some forty-five hundred acres of the land of Keauhou, as a private forest reserve, from which stock are excluded.

The ultimate afforestation of the upper slopes of Mauna Loa, as well as those of Mauna Kea is a part of the general plan of

the Division of Forestry, but as this work must necessarily wait for the present, recommendations concerning it would be out of place in this report.

West Kau.

In the other end of the Kau District the forest problems are of a different character. Here it has been proved possible to develop water by the aid of the forest; springs and brooks yielding a regular supply when their sources are protected by a forest cover.

Messrs. C. Brewer and Company, largely at the instance of Mr. George H. Robertson, and Mr. Julian Monsarrat, have for a number of years kept fenced in and protected from cattle, a private forest reserve of some twelve miles in length, by from three to four miles in breadth, containing 25,000 acres, more or less. From this area enough water has been developed to carry on successfully a large sugar plantation.

Other interests in Kau, particularly the Hutchinson Plantation Company, are desirous of extending this reserve or making other similar ones, with government cooperation. The investigations on the ground which will lead to recommendations in regard to these proposed reserves will be made as early in the coming year as circumstances permit. It is an important question and should be taken up as soon as may be.

Another large problem which awaits solution in Kau is the clothing of the barren lava flows with vegetation. It is hoped that when the more pressing work of establishing forest reserves is accomplished this subject can be tackled. It offers many difficulties but is for that reason all the more worth while.

Attention is called to the reports of Messrs. Julian Monsarrat and Geo. C. Hewitt, the District Foresters for Kau.

Kona.

The district of Kona embraces so large an area that it can best be considered by sections.

South Kona.

South Kona from the Kau boundary to and including the land of Honokua is a region of comparatively recent origin.

While not as young geologically as parts of Kau it yet contains many square miles of rough "a-a," and fields of "clinkers" but scantily, if at all, covered with vegetation.

Among the rocks, however, are pockets of rich and very fertile soil, so that in limited areas almost every kind of valuable plant, suited to this latitude and climate, can be made to grow luxuriantly. But unfortunately for the producer the market is limited and far off and the cost of transportation high.

There is much forest in this section and some of it would be of no small commercial value were there a better chance of getting out the lumber. At present only a few trails penetrate the forest, making but a narrow belt along the Government road accessible. Beyond this the country is practically unknown. Matters in South Kona would be greatly simplified if a classification of the Government land into its several classes were made, when an intelligent plan of development could be formulated. Were this done there would be found many areas of lava too rough for any sort of agriculture, or even grazing, which might be made to produce trees. In my judgment all of the land in South Kona which can be developed ought to be thrown open while the remaining a-a and clinker fields, should be left in forest. Further recommendations are unnecessary at this time.

Mr. Franz Buchholtz, the District Forester for South Kona, has for some years carried on valuable experiments in tree growing in this district. In his report will be found some account of them, with other pertinent observations. His report should be read.

Middle Kona.

The stretch from the land of Honokua to the old Judd road, or to the lands of Holualoa, may be called Middle Kona. It is essentially an agricultural section, which is and should be devoted to the various "diversified industries."

Above the agricultural land and stretching well up onto the slope of Mauna Loa is a belt of forest. It is a mixed forest of the usual Hawaiian type, in which Ohia Lehua and Koa predominate. The lower edge varies from 2500 to 3000 feet in elevation and the forest runs out at about 6000 feet. Portions of this forest belt have been used for many years as grazing land and the forest there, as might be expected, is open and without

undergrowth or young trees. Elsewhere it has been protected from cattle and is a dense and impenetrable jungle. Notable in this connection is the private forest reserve made by the Bishop Estate on the lands of Kahauloa 2, Honaunau and Keokea. This area covers about 11,600 acres and has been fenced against cattle for a number of years.

The effect of the belt of forest above the settlements in Kona upon the general welfare of the district is hard to determine, but it may safely be said that a conservative policy in its management is to be preferred to one which will lead to a decided reduction of its area.

The ownership of by far the larger part of Kona rests in individuals or corporations, so that the Government can only act in an advisory capacity. The present policy of unrestricted grazing in the forest belt can but result in the long run in reducing the forest area. The question for the large owners to determine is, "How far can this reduction go on without detriment to our other interests?"

The Government also is interested in the question in a larger way because of its bearing on the welfare of the community for all time.

In answering these questions, the Division of Forestry stands ready to help, so far as it may, by studying the problems on the ground, in detail, and by recommending what in each case is believed to be the right course to pursue. The Bishop Estate has taken the lead; will the other interests follow?

While not strictly a forest cover, it may be noted here that the Lantana has spread in late years over a large area of low lying lava land in Middle Kona. A noticeable change in the climatic conditions is said, by the people living in the district, to have followed this covering of the easily heated rock by a coat of cool vegetation. Light clouds which formerly passed over are said to now drop their contents at the lower levels, the showers so resulting adding materially to the comfort and welfare of the district.

This is an interesting example of the sort of influence which a forest tends to exert, only in a more perfect way and on a larger scale.

It may be noted also that the Algaroba is spreading along the Kona coast, as it is on the leeward side of the other islands.

Within a few years there will be a noticeable difference in the appearance of this coast.

The report of the Hon. J. D. Paris, the District Forester for Central Kona, should be read in this connection.

North Kona.

By North Kona is meant that part of the Kona District north of the old Judd road. This section is notable from lying practically altogether on the sides of Mt. Hualalai, which rises to an elevation of 8,269 feet.

On the north and west sides of this mountain, at an elevation of from 4,000 to 5,500 feet is a belt of Koa forest which is potentially of no small value. I have already recommended that as much of it as is on Government land be set apart as a forest reserve. Later when the expected market has developed it should be lumbered under the conservative methods of practical forestry and thereafter be made to yield subsequent crops of valuable timber at regular intervals.

As the forest hereabout contains springs capable of development, I further recommend that this reserve be extended to include and protect their sources. It should be distinctly understood that the reserve here proposed is above and outside of the land suited for settlement.

For some years a private forest reserve has been maintained by the owners of Puuwaawaa Ranch, on the land of that name leased from the Government on the northern slope of Mt. Hualalai. This forest which contains some of the Koa described above, ought to be continued as a forest reserve, and later formally set apart.

The report of Mr. J. A. Maguire, the District Forester for North Kona, should be read in connection herewith.

Other Work of the Division of Forestry.

THE GOVERNMENT NURSERY.

Although the main efforts of the Division of Forestry during the past year have been directed toward the establishment of forest reserves, other lines of work have, so far as the limited

appropriation allowed, also been carried on. Chief among these is the Government Nursery. This may well be considered by the four sections into which the work is naturally divided; Plant Distribution, Experimental Work, Seed Collection and Advice and Assistance.

From July 1st to October 9th, 1903, Mr. C. J. Austin was in charge of the Nursery. He was then transferred to the Division of Entomology, being succeeded as Gardener by Miss Clare M. Kelley. Miss Kelley gave faithful and intelligent service until June 10, 1904, when lack of funds prevented her further employment. Since that date Mr. David Haughs has been in direct charge of the Nursery, having been transferred from the Nuuanu Forest Station, where he had been located for some time.

On September 30th, 1904, the Japanese laborers at the Nursery and the Nuuanu Station, some of whom had been employed for seven or eight years, were discharged in accordance with the Citizen Labor Law, their places being taken by Portuguese. Owing to the higher wages paid to the new men the number of laborers was reduced from eight to five.

Plant Distribution.

The present year has been marked by a change of policy in the manner of running the Nursery. Instituted at a time when there was real need for beautifying Honolulu, the free distribution of ornamental shrubs and plants had assumed such proportions as practically to exclude other uses. Furthermore it had come to pass that the free distribution hardly reached beyond Honolulu.

Feeling that the Nursery should be devoted primarily to the growing of forest trees and to experimenting with new or little known trees and shrubs, I recommended early in the year that the free distribution be discontinued. In this I was further influenced by the necessity for retrenchment due to the existing financial stringency, as well as by a desire not to compete with commercial nurserymen who were or might be doing business in the Territory.

Accordingly, by direction of the Board, the free distribution was discontinued and the ornamental stock on hand closed out.

Since May the trees, plants, and seed in the Nursery have been on sale at prices just covering the cost of growing or collection.

The Nursery is now run with the object of supplying forest and shade trees at cost, to any one who may desire them and of keeping on hand good seed of the important native and introduced trees and shrubs. Schools and public institutions are still supplied free, upon application, and a limited number of palms is kept on hand for this use. Details of this section of the Nursery work will be found in the report of the Field Foreman.

Experimental Work.

The experimental work during the past year has consisted for the most part of trials of exotic seed at the Nursery and at selected points on the other islands, and of germination tests at the Nursery of seed collected locally. The Division of Forestry is in correspondence with men and institutions throughout the world and by exchange and purchase this branch of the work will be carried on.

There is room as well for experiments in methods of propagating new trees and shrubs, other than by seed, which it is hoped may later be taken up.

Under the head of experimental work may also be classed the gathering of scientific data, such as notes upon the times and period at which the trees in and around Honolulu are in flower and fruit. Systematic notes are being kept which in the end should yield valuable information.

Seed Collection.

The collection of seed, both of native and of introduced trees, is one of the most important branches of the Nursery work. It is the intention to have on hand, and for sale, at prices just covering the cost of collection, seed of all the trees which can be recommended for use in the different parts of the Territory. The seed kept on sale is carefully tested and will be warranted pure and fresh. Owing to this branch of the work having been hampered by lack of men to do the collecting, not as large a stock is now on hand as could be wished, but every day adds to the collection and soon the Nursery will be able to supply all reasonable demands.

Advice and Assistance.

Another way in which the Division of Forestry is of value to the people of the Territory is through the advice and assistance which it is prepared to give upon application, to those who wish to manage their forest land in accordance with the principles of practical forestry, or to establish plantations of forest trees.

The only formalities attending this offer are that requests shall be made in writing and that the traveling expenses and subsistence of the agent, during the visit, shall be paid by the applicant. In giving its advice the Division of Forestry reserves the right to make public such facts and figures in regard thereto as it may deem proper.

As yet the assistance given has been for the most part confined to places in and near Honolulu, the advice sought being mainly in regard to the planting of street and shade trees.

A little later when more men and money become available, it is hoped to make this one of the principal lines of work of the Division. It is probable that the National Bureau of Forestry will be able to help the Division in this particular.

In standing ready thus to assist the private owner, by showing him how to go about his forestry work and by furnishing him good seed at cost, I believe that far better and more lasting results will be attained than were possible under the indiscriminate free distribution of the past.

NUUANU FOREST STATION.

The work at the Nuuanu Valley Forest Station has also undergone modification during the year. Although of much interest, the results being obtained did not in my judgment justify the outlay. Until it is more definitely known how the various trees being used will act under given conditions, extensive planting seemed to me unwise. The planting of new areas was therefore discontinued.

The plantations already made are being cared for and protected, and careful record is being kept of the trees in them, to find out which kinds are doing the best. With the experience thus gained as a guide, if it is later found advisable to resume planting, it can be undertaken with a good chance of success.

Special attention is called to the accompanying report of Mr. David Haughs, Field Foreman of the Division of Forestry. In it will be found a discussion in detail of the several sections of the Nursery and Nuuanu Station work outlined above.

OFFICE WORK.

The routine work of the Division of Forestry was, early in the year, systematized and made effective. In March a Globe-Wernicke Vertical Filing Cabinet was installed, in which the correspondence and reports of the Board and of the Division of Forestry are filed, according to the numerical vertical filing system, the most convenient and up to date system of loose sheet filing now known.

The correspondence of the Division of Forestry is rapidly increasing, so that all helps of this sort are not only useful but essential.

A mailing list, made up of the names of persons throughout the Territory, who are or should be interested in forestry, has been compiled.

Collections of maps of forest and other lands, of forest photographs, and of forest statistics and other data have been started, and will be added to as opportunity offers.

Mention may well be made here of the painstaking and conscientious work of the Board's stenographer, Miss Melika Peterson. Had it not been for her interest and devotion to her duties, the routine work of the Board and of the Division of Forestry would have been seriously hampered.

HERBARIUM.

An Herbarium has been begun, which it is hoped will in time include specimens of all the aborescent plants in the Territory, both native and introduced, as well as of other plants which are of economic importance. The value of such a collection, properly labelled and described, is hard to overestimate.

MUSEUM.

The Board was fortunate in falling heir to the collections of native Hawaiian woods and of the various fruits grown in the Territory, intended for the Exposition at St. Louis, but which from lack of funds could not be sent.

The logs have been cut and polished in the same manner as are the specimens in the Morris K. Jessup Collection of American Woods, in the Museum of Natural History, in New York City. The collection number sixty-three specimens of forty-four varieties of island woods.

The fruits are to be placed in special exhibition jars, where they will show to advantage.

These exhibits are being installed in the Museum room in the Board's building and will be open to the public early in January.

LIBRARY.

At the meeting of the Board held on March 9, 1904, I was requested to take charge of the library of the Board. The report of the library for the past year may therefore perhaps best be included here.

Soon after his arrival in the Territory, in July, 1903, Mr. G. W. Kirkaldy (now of the Hawaiian Sugar Planters' Association Experiment Station) undertook the arrangement and classification of the books and other publications belonging to the Board, and by the time of the Bureau's removal to its new and commodious quarters, had evolved system out of a veritable chaos. Through the efforts of Mr. Kirkaldy and of myself, the Library has received many additions through gift and exchange, and is now in the way of getting most of the publications dealing with agriculture in its broadest sense, which can be had free from the Federal Government, the several States, and a number of foreign countries.

Some few forestry and rather more entomological books have been purchased during the year, but limited means have prevented the addition of any considerable number. This is most unfortunate because there are many books, especially on botany and entomology, which are imperatively required for the proper carrying on of the regular work of the two Divisions. It is sincerely hoped that a considerable sum can be devoted to the purchase of books the coming year.

Of the publications that have been bought during the last year special mention may be made of the "Index Kewensis," Bentham and Hookers' "Genera Plantarum," and complete files of the "Zoological Record" and the "Canadian Entomologist."

As the law creating the Board, makes mandatory the main-

tenance of a library, this library has come to be regarded as the Department of Natural Science of the Library of the Territory. By direction of Governor Carter all books in his office and in the Archive Room at the Capitol, dealing with the subjects which come under this general head, have been turned over to the Board for custody and safe-keeping.

The Hawaiian Live Stock Breeders' Association has also deposited its library with the Board, pending such time as the Association may have rooms of its own. This collection is kept in a separate case, but is open to the public.

A regular card catalogue, by subject, author and title has been begun and will be pushed as rapidly as may be, while a system of keeping track of accessions by means of a card catalogue has also been started.

The Federal, State and other publications have been systematically arranged on shelves in the Board room, and the library is open to the public for reference, daily, during office hours. As the library increases in size and becomes better known, it is hoped that it will be more and more consulted. No formalities attend its use.

GROUNDS.

The grounds of the Government Nursery have been much improved in the past few months by the removal of many trees and shrubs of minor value, by the planting of grass and by a general cleaning up. Labels bearing the scientific and common names are, or will soon be, attached to each tree. In this way a start is being made toward an aboretum; which it is hoped may some day result in a systematic collection of growing specimens of the native and introduced trees and shrubs. Such a plantation could well be made along the road through the forest on Mt. Tantalus.

OTHER FORESTRY MATTERS.

Mention has already been made of the publication by the U. S. Bureau of Forestry of Bulletin No. 48—"The Forests of the Hawaiian Islands," by William L. Hall.

During the year numerous reports of mine upon various forestry subjects have appeared in the Hawaiian Forester and Agriculturist, the official organ of the Board, and in the local

newspapers. No bulletins or circulars have yet been issued by the Division of Forestry.

Continued correspondence has kept the Division of Forestry in close touch with the U. S. Bureau of Forestry at Washington. Mr. Gifford Pinchot, the Forester, has repeatedly expressed his interest in the work here and various members of the Bureau staff have been of assistance in one way or another. All this results in no small benefit to the Division.

Among the many visitors to Honolulu during the past year there have been some foresters. Captain George P. Ahern, Chief, and Mr. Ralph C. Bryant, Assistant Chief, of the Philippine Bureau of Forestry, have both passed through town, while several other men connected in various ways with forest work in different parts of the world have called at the office. Personal contact of this kind is of importance in questions of exchange and co-operation which may later come up.

As custodian of the building it may not be out of place to mention here that the Library, or Board room, was on November 10th and December 21st, 1904, used for forest reserve hearings, held by the Governor and the Board.

The room has also been twice used, on April 23rd, and on December 12th, 1904, for public meetings of the Farmers' Institute of Hawaii. It is hoped that the use of the building for such purposes will continue and increase.

PLANS FOR THE COMING YEAR.

The work for the Division of Forestry for the coming year will in general be similar to that of which this report tells, but with certain important additions.

The creation of forest reserves will hold first place, as it has this year; the pending forest reserves in Koolau and Hamakualoa, Maui, Hilo, Hawaii, and Halelea, Kauai, being followed by investigations and reports with recommendations, on forest land elsewhere in the Territory.

Among the places which should be taken up in the near future, as being in perhaps the most immediate need for forest protection, are the Kohala and South Hamakua districts on Hawaii, the West Maui section on Maui, the Ewa and Waialua Basins on Oahu, and the districts of Puna and Kona on Kauai.

Portions of Kau on Hawaii, Kula on Maui, and the Waianae Hills on Oahu also deserve early attention, as do some parts of Molokai. There is no lack of work to be done; the principal reason why some of it should come sooner than the rest being that in a section like Kohala, unless something is done in very short order the time for saving the native forest will have passed.

With the creation of forest reserves the necessity for establishing a system of administration becomes paramount.

In the reduction of the appropriation last spring the amounts to be devoted to this use fell out altogether. As no reserves had at that time been set apart, this was then perhaps as good a place as any at which to retrench, but with the creation of the several reserves, which are now practically assured, the case is now a wholly different one.

To secure an effective system of forest control takes men. Without such a system the value of forest reserves is very seriously lessened. It is therefore imperative that the organization of a forest ranger service be made a prominent feature of the forestry work of the coming year.

The various other branches of forestry work will be continued during the coming year as far as men and means allow, especially the work classed as Seed Collection and Advice and Assistance. Mr. Pinchot has promised to send a man to help in the latter work, whenever one is available. It is probable that such an assistant can be expected during the coming year.

With the more important lines the experimental work will be kept up and the herbarium and other collections added to, as opportunity allows.

The widespread sentiment in favor of forestry which exists throughout the Territory makes the outlook an extremely favorable one, and with an appropriation by the Legislature of an amount which the importance of forestry work in the Territory justifies, the coming year ought to be one notable in the annals of forestry in Hawaii.

Respectfully submitted,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF DAVID HAUGHS, FIELD FOREMAN, DIVISION OF FORESTRY.

HONOLULU, T. H., Dec. 31, 1904.

RALPH S. HOSMER, ESQ.,
Superintendent of Forestry,
Honolulu.

DEAR SIR:—I herewith submit a report of the work done at the Government Nursery and at the Nuuanu Forest Station from July 1, 1903, to December 31, 1904.

NURSERY.

Plant Distribution.

Previous to October 9th, 1903, Mr. C. J. Austin was in charge of the Nursery, during which time no plants were given out on account of the prevalence of insects and blights.

On October 9th, 1903, Miss Clare M. Kelley was appointed Gardener and served until June 19, 1904, when the writer was transferred from the Nuuanu Valley work and put in charge of the Nursery.

Up to December 29th, 1903, plants were distributed free to the public. By a motion passed at a meeting of the Board of Commissioners of Agriculture and Forestry, held on December 29th, 1903, it was decided to offer the plants on hand for sale at a nominal figure.

Since the above date, a charge has been made on plants, the following public institutions, however, being still left on the free list: Churches, schools, court-houses, parks, etc.

The following table shows the number and kind of plants distributed to the several islands; from October 9th, 1903, to date.

TABLE SHOWING DISTRIBUTION OF PLANTS FROM THE GOVERNMENT NURSERY, OCTOBER 9, 1903, TO DECEMBER 31, 1904.

	Forest Trees	Fruit Trees	Ornamental Plants
Given away	4,023	1,548	5,494
Sold	3,271	34	84
	7,294	1,582	5,578
Grand Total			14,454

The sale of plants has resulted in receipts of $630.68, which has been paid into the Treasury as a realization.

Owing to the limited help we have at our command at present, the work of the Nursery is hampered in all lines. Since October 1st three men only, could be employed; one man acting as janitor, also attending to the horses and driving wagon; one collecting seeds, cleaning up, etc., in Nursery; one attending to plants, irrigating, etc. These men have also to work for the Division of Entomology when required.

EXPERIMENTAL WORK.

Experiments With Exotic Seeds.

A consignment of seed ordered from India by Commissioner W. M. Giffard and received October 13th, 1904, has done as well as could be expected. The *Albizzia stipulata, Tectonia grandis, Corchorus olitorius* and *Mimusops,* arrived in good contion. The *Cochorus olitorius* (Jute) after being tested was handed to Mr. Jared G. Smith, as we had no land suitable for experimenting in Jute. The others are doing well.

Another package of seed presented to the Division of Forestry by Commissioner Giffard, who received the same from Mr. Thomas H. Sedgwick, late of the U. S. Experiment Station, and now in Peru, has done exceedingly well. The name on the package was "paipai," which is probably a native name. A search in our botanical books failed to find this name. Mr. Sedgwick says, "the tree is used in Peru for the same purposes as the *Proposis juliflora* (Algaroba) is used for here."

Another important introduction presented to this Division by Commissioner Giffard is a new Algaroba *Prosopis pubescens* (Tornillo or Screw Bean). The beans of this tree have proved by an analysis to be richer in saccahrine matter than our *Prosopis juliflora* (Algaroba). The seed was received on December 6th and sown the same day. They started to sprout two days later.

The following seeds handed this Division by Commissioner Giffard were collected by the late S. T. Alexander in South Africa. They were received December 7th and sown on the same day:

1 package *Erythrina tomentosa.*
1 " Mlangi Cedar.
1 " *Coffee robusta* var *Uganda* (Native coffee).
1 " *Pandanus* sp. (Collected at Lake Myanza.)
1 " *Solanum robustum.*

The following seeds were received from Professor Koebele, on Sept. 21st, and sown the same day:

1 package Queensland Bean tree.
1 " *Ptychosperma cunninghamia.*
1 " Queensland Plum.

None of these have sprouted so far.

From Mr. G. N. Wilcox of Kauai, we received a large quantity of *Ceritonia saliquay* (St. John's Bread) seeds. Also from Mr. Wilcox came fruit and seventeen seeds of the Durian tree. Every one of these seeds sprouted and they are all doing well.

Seeds of trees and shrubs from the Western United States, especially California, have been received through the courtesy of the Bureau of Forestry and the Pacific Coast Laboratories of the Bureau of Plant Industry, both branches of the U. S. Department of Agriculture.

Some of these seeds have been tried in the Nursery while others have been furnished to district foresters and others to be tried at higher elevations, elsewhere in the Territory.

In this connection a shipment of coniferous seed from the Southern Californian Mountains, sent by Mr. T. P. Lukens of Pasadena, California, should be noted.

The experimental work of the Nursery also includes the propagation of aborescent exotic plants, new or little known

in these islands, and experiments in budding and grafting fruit and other trees. A wide field of work is open in this direction, were men and funds available, with which to carry it on.

COLLECTION AND DISTRIBUTION OF SEEDS.

The seed collecting has been done mostly around Honolulu. Tantalus has supplied the majority of the forest tree seed, while seed of the shade and ornamental trees has been collected in Honolulu. Great care has been taken in collecting from the most healthy and mature trees, so that the best results might be obtained. Seed received from abroad is tested before being distributed to the public, so that people ordering seed from this Division can rest assured that they are getting the best and freshest seed that can be obtained. With ordinary care there ought to be no trouble in making a success in raising it.

Only the actual cost of collecting and sorting is charged. By comparing the prices with those on the coast or foreign countries it will be found that there is a large discount in favor of dealing with the Division of Forestry.

Another point to be considered in dealing with this Division is that the seeds collected here are from trees that are acclimated and have done well in these Islands and are thus likely to make a faster growth than the same kinds imported from abroad. We would therefore urge that people contemplating tree planting on a large or small scale first consult the Division of Forestry instead of wasting time in experimenting with new and untried species.

On our exchange list we have among others the U. S. Bureau of Forestry, Washington, D. C.; Bureau of Forestry, Manila; Public Works Department, Guam; Pacific Coast Laboratories; Dr. John Gifford, Cocoanut Grove, Dade Co., Fla.; Mr. T. P. Lukens, Pasadena, Cal., and Dr. C. A. Schenck, Forester, Biltmore Estate, Biltmore, N. C. We have forwarded seeds, and have received in return shipments of seeds or the assurance that seeds in exchange would be forthcoming from all the above. We are also in communication with most of the Botanical Gardens throughout the world.

TREES AND PLANTS ON HAND DECEMBER 31, 1904, FOR SALE AND FOR DISTRIBUTION.

In Pots.

No.	Common Name	Scientific Name.
150	.....	*Berrya ammonilla*
100	Ironwood	*Casuarina equisetifolia*
700	Lemon Scented Gum	*Eucalyptus citriodora*
150	Red Gum	*Eucalyptus polyanthema*
800	Swamp Mahogany	*Eucalyptus robusta*
2200	Silk Oak	*Grevillea robusta*
144	Ohai	*Sesbania tomentosa*

In Boxes.

No. bxs.	Common Name	Scientific Name.
20	Ironwood	*Casuarina equisetifolia*
6	.....	*Casuarina glauca*
6	Monterey Cypress	*Cupressus macrocarpa*
1	Java Plum	*Eugenia jambolana*
2	Lemon Scented Gum	*Eucalyptus citriodora*
1	Swamp Mahogany	*Eucalyptus robusta*

TREES AND PLANTS ON HAND DECEMBER 31, 1904— IN EXPERIMENTAL PLOTS.

(Not available at present for distribution.)

No. Pots	Common Name	Scientific Name	Locality received from
90	Mango	*Mangifera indica*	.....
500	.....	*Albizzia stipulata*	.....
16	Durian fruit	*Durio ziebethinus*	.....
90	"Paipai"	.....	.....
12	Teak	*Tectonia grandis*	India
Bxs.			
2	European Chestnut	*Castanea sativa*	.....

No. Pots	Gommon Name	Scientific Name	Locality received from
2	Jaya	.....	Peru
1	.....	*Erythrina tomentosa*	S. Africa
1	.....	*Pandanus* sp.	S. Africa
1	Mlangi Cedar	.....	S. Africa
1	.....	*Solanum robustum*	S. Africa
2	Screw Bean	*Prosopis pubescens*	Arizona

About 1000 assorted plants ordered by public institutions remain in the Nursery.

BOTANICAL WORK.

A commencement has been made on a table which will give the flowering season of all the indigenous and exotic plants now in the Territory. This work will have to be continued over several years so that as correct an average as possible may be made.

An herbarium of the arborescent flora has also been started, which will be added to as opportunity offers.

ADVICE AND ASSISTANCE.

One of the duties of this office is to give advice in the propagating, planting and care of trees. During the period covered by this report twenty-seven persons have called for advice on the above subjects, and at the request of owners of lands ten visits have been made to as many tracts in and around Honolulu. By first visiting the tracts, when advice is asked, a more accurate and satisfactory statement can be made regarding the planting.

The principal information asked for in such case is as follows: "The best method of propagating seeds," "kinds of trees to plant," "size of holes," "distance apart," etc.

PRIVATE NURSERIES.

Inquiries have been made from time to time of the different owners of private nurseries in the city regarding the class of plants they wish to keep in stock for sale, that such information

may be given to persons inquiring at this Nursery. It is the desire of the Board of Commissioners of Agriculture and Forestry to assist rather than infringe on the business of the private nurseries. This, indeed, is one of the reasons why the Government handles only such stock as forest and shade trees, the latter being in great demand in large quantities for road and street planting.

We would urge, however, that those desiring large quantities of forest or shade trees notify us several months in advance so that the trees required may be on hand when wanted.

Current seed and plant catalogues are also kept on file for the use of the public, who can have recourse to them at any time during office hours. They comprise catalogues from most of the leading firms in the United States, Australian Colonies, India, Ceylon, etc.

NURSERY IMPROVEMENTS.

Owing to the crowded condition of the Nursery considerable thinning has been done. Unimportant and duplicate species have been removed and those left have been pruned, so that each species has now room to grow and show its characteristics to better advantage. Most of the shrubs, such as the Crotons, Hibiscus, Panix, etc., have also been removed. Grass has been planted where the dense shade kept it from growing before. Wooden curbing has been laid around three sides of the office building and plots at each end of the building and on the west side have been planted in grass. An eight-inch pipe has been laid to carry the roof and surface water away from the building. The King street gate has been changed so that it is now directly opposite the front door of the offices and the fence around the Nursery has been repaired and given a coat of green stain.

The planting of grass was done by a gang of prisoners sent by Mr. C. S. Holloway, Superintendent of Public Works, otherwise the work could not have been done owing to the limited help we have at our command. It is to be hoped that the prisoners will be allowed to come and assist in keeping the grounds in good condition.

A systematic and continued effort is being made to rid the Nursery of the "Nut grass" or "Coco" (*Cyperus rotundus*) which is one of the worst weed pests that can get into our gardens here.

Its presence in the Nursery has prevented the use of one portion of the grounds for experimental plots, through the fear that the weed might be spread if plants were sent out with soil adhering to their roots.

TREES TO BE LABELED.

Labels are being prepared and each tree will soon be marked with its correct name, both common and scientific, so that with the use of the Library, which is open to the public, during office hours, a grand opportunity is offered for those interested in the study of Arboriculture.

That this opportunity is appreciated is proved by the number of visitors to the grounds, who have come primarily to see the trees and learn something about them.

NUUANU FOREST STATION.

The following is a report of the work done at the Nuuanu Forest Station from July 1st, 1903, to December 31st, 1904.

The work has been divided as follows: Making leaf pots and transplanting, this work being done during heavy rains when the men could not work outside; clearing grass and vines away from young trees, rooting out Lantana, making holes and planting.

The number and kinds of trees planted out during the period are as follows:

During 1903:

Australian Blackwood (*Acacia melanoxylon*)	2,600
Ironwood (*Casuarina equisetifolia*)	2,000
Silk Oak (*Grevillea robusta*)	4,800
Swamp Mahogany (*Eucalyptus robusta*)	5,000
Total	14,400

Number and kinds planted during year 1904:

Acacia melanoxylon	980
Casuarina equisetifolia	2,696
Casuarina quadrivalvis	280
Casuarina tenuissima	750
Eucalyptus robusta	9,281
Eucalyptus calophylla	100
Grevillea robusta	1,724
Total	15,811
Total for 1903-4	30,211

On March 16th, 1904, work was started on six experimental plots on close planting. The piece of land selected is on the Ewa side of Government road, about 300 yards below the lower end of the road which leads to quarters.

Six plots were made with a twelve-foot alley between the plots. Commencing from upper end, in Plot 1, 51x210 feet, the trees were planted 3x3 feet. Total trees in Plot: 1,190, planted in *Casuarina tenuissima.*

Plot 2, same size as No. 1, planted in *Eucalyptus robusta,* 1,190 trees.

Plot 3, 52x208 feet, trees planted 4x4 feet. Total number in Plot, 676, planted in *Casuarina equisetifolia.*

Plot 4, same size as Plot 3, planted in *Eucalyptus robusta,* 676 trees.

Plot 5, 50x120 feet, trees planted 5x5 feet, total number in Plot, 420, planted in *Casuarina equisetifolia.*

Plot 6, same size as Plot 5, planted in *Eucalyptus robusta,* 420 trees. This work was finished on May 14th.

A wind break nine feet high and one hundred and fifty feet long was made at a place where the trees had never done well owing to the exposed position, to see if after getting well started the trees could withstand the wind. Two hundred *Eucalyptus robusta* trees were planted behind this wind break 6x6 feet each way. This work was completed May 21st, since that time no planting has been done.

Previous to March 31st, 1904, eight men were employed, after which the gang was reduced to four. On May 5th, two

men were transferred to assist in the King Street Nursery, two being left at the Nuuanu Station. One man was returned to Nuuanu Station June 27th, and the three worked at the station until September 5th, when one man was again transferred to the King Street Nursery to assist in removing trees, etc. Since that time only two men have been employed at the Station, their work being caring for the trees that have been planted out, cutting and clearing away grass and vines, etc.

Very little can be said at this time about the trees on the experiment plots or behind the wind break as neither have grown large enough to receive the full force of the wind. At present they are all growing well and looking healthy.

The four kinds mentioned in previous reports as being the best are still holding that position against the many other kinds that have been tried in Nuuanu. Their names are as follows:

Australian Blackwood (*Acacia melanoxylon.*)
Ironwood (*Casuarina equisetifolia*)
Swamp mahogany (*Eucalyptus robusta*)
Silk oak (*Grevillea robusta*)

Respectfully submitted,

DAVID HAUGHS,
Field Foreman.

LIST OF FRUITS IN THE MUSEUM OF THE BOARD OF AGRICULTURE AND FORESTRY.

Common Name	Scientific Name	Varietal Name (if any)
Apple	*Pyrus malus*	.....
Algaroba pods	*Prosopis juliflora*	.....
Chopped pods	*Prosopis juliflora*	.....
Avocado pear	*Persea gratissima*	.....
Banana	*Musa sapientum*	.....
Bael fruits	*Aegle marmelos*	.....
Bermuda grass	*Synodon dactylon*	.....
Betelnut fruit	*Areca catechu*	.....
Bread Fruit	*Articarpus incisa*	.....
Broom Grass	*Anaropogon sorghum vulgaris*	.....
Bush beans	*Phaseolus vulgaris* var. *nanus*	Isabella
Cacao	*Theobroma cacao*	.....
Calabash fruit	*Crescentia cujete*	.....
Calabash gourds	*Cucurbita maxima*	.....
Carambola	*Averrhoa carambola*	.....
Cashew	*Anacardium occidentale*	.....
Cassava roots and stems	*Manihot utilissima*	.....
Castor oil	*Racinus communis*	.....
Cayenne Cherry	*Eugenia michelii*	.....
Celery	*Apium graveolens*	.....
Cocoanuts	*Cocos nucifera*	.....
Coffee	*Coffee arabica*	.....
Coffee	*Coffee arabica*	Pea berry
Chinese Orange	*Citrus trifoliata*	.....
Chinese Plum	*Eugenia* sp.	.....
Citron	*Citrus medica* var. *genuina*	.....
Corn	*Zea mays*	Mammoth Sweet

Common Name	Scientific Name	Varietal Name (if any)
Cow Pea	*Vigna catjang*	.....
Cow Pea	*Vigna catjang* var. *sinensis*	.....
Dates	*Phoenix dactylifera*	.....
Dates	*Phoenix dactylifera*	Haw. seedling
Egyptian cotton	*Gossypium* sp.	.....
Seed of Egyptian cotton	*Gossypium* sp.	.....
Grapes	*Vitus labrusca*	.....
Grapes	*Vitus labrusca*	Isabella
Guava	*Psidium guayava* var. *pyriferum*	.....
Guava jelley	.....	.....
Strawberry Guava	*Psidium cattleianum*	.....
Guinea Grass	*Panicum altissimum*	.....
Indian Corn	*Zea mays*	.....
Jack Fruit	*Articarpus integrifolia*	.....
Jerusalem Corn	*Andropogon sorghum vulgaris*	.....
Kaffir Corn	*Andropogon sorghum vulgaris*	White
Kukui nuts	*Aleurites moluccana*	.....
Kukui oil	.....	.....
Lauhala fruit	*Pandanus odoratissimus*	.....
Lauhala seeds	*Pandanus odoratissimus*	.....
Lemons	*Citrus medica* var. *limon*	
Limes	*Citrus medica* var. *acida*	.....
Litchi	*Nephelium litchi*	.....
Longan	*Nephelium longana*	.....
Macadamia nuts	*Macadamia ternifolia*	.....
Mammee Apple	*Mammea americana*	
Mandarin	*Citrus nobilis*	.....

Common Name	Scientific Name	Varietal Name (if any)
Mango	*Mangifera indica*	Samoan
Mango	" "	Pineapple
Mango	" "	Vanilla
Mango	" "	Lady finger
Mango	" "	Herbert's No. 9.
Mango	" "	No. 9
Mango	" "	Indian
Mango	" "	Turpentine
Mango	" "	Robin
Mango	" "	Mangostin
Mango	" "	Chinese
Mango	" "	Double Pointed Manila
Mango	" "	French
Mango	" "	Waianae Mission
Mango	" "	Hawaiian Sweet
Mango	" "	Kauai Chutney
Mango	" "	Strawberry
Milo maize	*Sorghum vulgaris*	.....
Monstera	*Monstera deliciosa*	.....
Mountain Apple	*Eugenia calacensis*	.....
Ohelo	*Vaccinium reticulatum*	.....
Oil Palm seeds	*Elaeis guineensis*	.....
Orange	*Citrus aurantium* var. *sinensis*	Haw. seedling
Orange	*Citrus aurantium* var. *sinensis*	Navel
Otaheite Gooseberry	*Phyllanthus distichus*	.....
Paddy or rough rice	*Oryza sativa*	.....
Papaia	*Carica papaya*	Long
Papaia	*Carica papaya*	Large round
Para grass	*Panicum molle*	.....
Paspalum	*Paspalum dilitatum*	.....
Pear	*Pyrus sinensis*	.....
Peppers	*Capsicum* sp.	.....
Pineapple	*Ananas sativus*	.....

Common Name	Scientific Name	Varietal Name (if any)
Poha or Cape Gooseberry	*Physalis peruviana*	.....
Pomelo	*Citrus decumana*	.....
Pomegranate	*Punica granatum*	.....
Potatoes	*Solanum tuberosum*	
Prickly Pear	*Opuntia tuna*	.....
Pulu from Tree Fern	*Cibotium chamissoi*	.....
Pulu from Tree Fern	*Cibotium menziessi*	.....
Rice heads	*Oryza sativa*	.....
Polished rice	*Oryza sativa*	.....
Hulled rice	*Oryza sativa*	.....
Sapodilla	*Achras sapota*	.....
Shaddock	*Citrus decumana*	.....
Sorghum	*Andropogon sorghum*	Amber
Sour sop		.....
Starch made from Manioc	*Manihot utilissima*	.....
Tamarind	*Tamarindus indica*	.....
Taro	*Colocasia antiquorum* var. *essentum*	Dry Land
Velvet Bean	*Mercuna utilis*	.....
Yard long beans	*Dolichos sesquipedalis*	.....
Water Lemon	*Passiflora laurifolia*	.....
Purple Water Lemon	*Passiflora edulis*	.....

LIST OF DISTRICT FORESTERS.

The following is a list of the District Foresters, with their respective jurisdictions:

DISTRICT FORESTERS.

ISLAND OF KAUAI.

Honorable Albert S. Wilcox, Forester, in and for that portion of the District of Hanalei extending from Waimea to and including the land of Kalihiwai.

Mr. Andrew Moore, Forester, in and for that portion of the Districts of Hanalei and Kawaihau extending from Kalihiwai to and including the land of Anahola.

Mr. George H. Fairchild, Forester, in and for that portion of the district of Kawaihau extending from Anahola to the District of Lihue.

Mr. F. Weber, Forester, in and for the District of Lihue.

Rev. J. M. Lydgate, Forester, in and for the District of Koloa.

Mr. Francis Gay, Forester, in and for the District of Waimea.

ISLAND OF OAHU.

Honorable D. Paul R. Isenberg, Forester, in and for that portion of the District of Honolulu extending from Makapuu Point, to and including Manoa Valley.

Mr. Walter F. Dillingham, Forester, in and for the Districts of Ewa and Waianae.

Mr. A. M. Nowell, Forester, in and for the District of Waialua.

Mr. Andrew Adams, Forester, in and for the District of Koolauloa.

Honorable L. L. McCandless, Forester, in and for that portion of the District of Kaalaupoko extending from Koolauloa to the land of Heeia.

Mr. C. Bolte, Forester, in and for that portion of the District of Koolaupoko extending from and including Heeia to the land of Kailua.

Mr. John Herd, Forester, in and for that portion of the District of Koolaupoko extending from and including the land of Kailua to Makapuu Point.

ISLAND OF MOLOKAI.

Mr. G. C. Munro, Forester, in and for the Island of Molokai.

ISLAND OF MAUI.

Mr. L. Barkhausen, Forester, in and for the District of Lahaina.

Honorable H. P. Baldwin, Forester, in and for the District of Kaanapali.

Mr. C. B. Wells, Forester, in and for the District of Wailuku.

Mr. H. A. Baldwin, Forester, in and for the Districts of Hamakualoa and Koolau.

Mr. L. von Tempsky, Forester, in and for the District of Makawao.

Mr. L. von Tempsky and Dr. J. H. Raymond, Foresters, in and for the Districts of Kula, Honuaula, and the lands beyond, to and including Kaupo.

ISLAND OF HAWAII.

Mr. E. E. Olding, Forester, in and for the District of North Kohala, and that portion of the District of Hamakua, lying between said District of North Kohala and Waimanu Valley.

Mr. F. W. Carter, Forester, in and for the District of South Kohala, and that portion of the District of Kohala and that portion of the District of Hamakua, lying mauka of the Hamakua forest reservation which is to be located along the northeasterly slopes of Mauna Kea.

Mr. George Ross, Forester, in and for that portion of the District of Hilo extending from the District of Hamakua, to and including the Honomu Plantation.

Mr. John Watt, Forester, in and for the District of Puna.

Mr. Julian Monsarrat, Forester, in and for that portion of the District of Kau extending from Puna to and including the land of Punaluu.

Mr. G. C. Hewitt, Forester, in and for that portion of the District of Kau extending from the land of Punaluu to the District of Kona.

Mr. Franz Buchholtz, Forester, in and for that portion of the District of South Kona extending from the District of Kau to the land of Kaohe.

Mr. Wm. R. Castle, Forester, in and for that portion of the District of South Kona extending from and including the land of Kaohe to the District of North Kona.

Honorable John D. Paris, Forester, in and for that portion of the District of North Kona extending from South Kona to and including the land of Kahaluu.

Mr. John Maguire, Forester, in and for that portion of the District of North Kona extending from Kahaluu to the District of South Kohala.

REPORTS OF DISTRICT FORESTERS.

Early in December the Superintendent of Forestry sent to each of the District Foresters a copy of the following letter. The reports received in response thereto are given below:

HONOLULU, T. H., December 3, 1904.

Dear Sir:

The law creating the Board of Agriculture and Forestry makes it mandatory that a report be made and published at the the end of each year.

As a part of the Annual Report of the Division of Forestry I wish to include special reports from the various consulting foresters. To this end I should be very glad to have you furnish me, not later than December 20th, with a short statement from your district, which can be published.

I would suggest that information on the following points would be in order and acceptable:

Planted Forest—Approximate area in your district, object of plantations, age, kind and size of trees, with special refer-

ence to those which have been found to do well; recommendations as to future planting, cost, and returns from cuttings.

Forest Nurseries—Number, size and capacity of those in your district.

Native Forest—Present condition, with special reference to any insect or other injuries sustained during the past year; notes on the utilization of any forest products.

Forestry in General—Notes on any other forestry matters.

In my own report will be a statement of what has been done in each district toward the creation of forest reserves, with an outline of what is proposed and recommendations thereon.

Thanking you for your contribution to the report, I am,

Very truly yours,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF MR. ANDREW MOORE.

Kawaihau—Kauai.

KILAUEA, KAUAI, H. T., Dec. 9, 1904.

Your favor of the 3rd inst. was received, in which you request information in reference to the Forestry conditions of this district.

Planted Forest—On this plantation there are about 40 acres that were planted with Ironwood trees about 15 years ago, under Mr. MacFie. The object in planting this acreage, which is divided into several plots, was to utilize waste land with the growth of a class of trees that would in time be remunerative, through supplying fence posts and wood, for fuel. The trees have grown very well, and while they are planted too thick to enable large trees to be grown, they have grown tall, being from 60 to 80 feet high. Where planted away from other trees, a very large growth is obtained. On account of favorable climatic conditions the trees grow very straight, so that flag poles 60 feet long are common, and have been cut from the plantations.

Blue Gum trees also have a very thrifty growth, where planted along roadways.

Trees of these or similar varieties can be grown to advantage anywhere on this plantation, as there is sufficient rainfall to maintain them. It would be necessary to clear the land of grass for the planting and to take care of the young trees until started.

Forest Nurseries—There are none in this district, nor has any special attention been devoted to this subject.

Native Forest—Twenty years ago the majority of the land in this district was covered with a growth of trees. Much of this was cleared away to make way for cane. There was left, however, a field of about 150 acres of Kukui trees, in about the center of the plantation. These trees have a very fine growth, and present a beautiful appearance, showing that the natural conditions are well suited for the growth of forests.

The trees in the Kukui grove are thick enough to shade the ground, preventing the growth of Lantana and grass below the trees, and around the roots. Where the trees are scattered the growth is affected by the roots being covered with a growth of grass, or shrubs.

The original forest on the lands not used for cane was cut for fuel, some being shipped to Honolulu in early days, and some being used for the plantation, so that now there are but few trees until the foothills are reached, then the trees are small and scattered, being thickly intergrown with grass, principally Hilo Grass, and Lantana.

At the same time one can see scattered all over the land dead stumps of trees of a very large growth, indicating that at one time the land was covered with a very heavy forest, principally of native Ohia trees. These trees furnish first-class fuel, also railroad ties, as the wood has a close grain, and is hard. A few Koa trees remain, but of small growth.

On account of the land being covered with a very heavy growth of Hilo Grass it is impossible for seed to reach the ground to be propagated, so that for a forest to be started on the lands of this district it will be necessary to clear them, and plant such trees as are wanted. The mountain sides still have a growth of small trees, but these are intergrown with grasses and Lantana, so that the growth of the trees cannot long remain healthy.

The grasses are not suited for grazing, so that the land is

practically valueless under its present conditions. It could be rendered very valuable if reforested, and as the climatic conditions are exceptionally favorable there is no reason why forests of very valuable woods may not be produced.

Should your department wish to have any trials made, the plantation will willingly carry out such instructions as you may give us in reference to the same, and in time the forest reserves may be of value.

Very truly yours,

A. MOORE.

REPORT OF MR. GEORGE H. FAIRCHILD.

Kawaihau—Kauai.

KEALIA, KAUAI, Dec. 17, 1904.

Replying to your letter of the 3rd inst., I am sorry that I am unable to report as desired. There has been nothing done in this district and the Government has provided neither men nor means to accomplish anything in the way of preserving the existing forests or enlarging them.

Colonel Spaulding has planted trees in a small way about his grounds, outside of that nothing has been done by private parties in this district.

The forests are in the same condition here as elsewhere about the Islands, and rapidly deteriorating, owing to the presence of cattle and other well known causes.

A preliminary forest line has just been laid over the lands of Kealea, Anahola and Kamalomaloo, but unless a fence is constructed the boundary line will be of no value,, of course.

Trusting the foregoing report, while of no value, explains the reasons for there being no opportunity to submit a valuable report, I am,

Very truly yours,

G. H. FAIRCHILD.

REPORT OF MR. F. WEBER.

Lihue—Kauai.

LIHUE, KAUAI, Dec. 20, 1904.

Pursuant to your communication of the 3rd inst. I take pleasure in submitting the following data as to the forests of this district:

Planted Forest—The first steps to introduce foreign trees in this district were taken by Hon. G. N. Wilcox in 1872, when this gentleman planted near his residence a grove of Ironwood trees (*Casuarina*) from seed taken from the old Government grounds in Honolulu, where the present well known firm of H. Hackfeld & Company, Limited, is now located. These trees have attained a height of probably 100 feet, and their trunks measure about 2 feet in diameter. Since then Mr. Wilcox has planted additional land in trees until now Grove Farm has about 75 acres covered with trees of the following varieties: *Grevillea robusta* (Australian Silver Oak), Eucalyptus, Pride of India, Java Plum, *Poinciana regia* and *Casuarina.*

In 1882 Lihue Plantation Company commenced to reforest on a larger scale an area of 600 acres, at an elevation of from 250 feet to 500 feet, with Ironwood, Koa, Cassia and Eucalyptus (Blue Gum) for the purpose of getting a supply of firewood and to retain the rain-water. The nature of this land is very hilly and of poor quality, still, all these trees have done well, except the Ironwood trees above the 400 feet level, which elevation appears to be the limit for this variety in this district. The forest has well served its purpose, yielding yearly about 250 cords firewood from trimmings and from thinning out, and having developed a steady stream of almost a million gallons of water in 24 hours.

A good deal of tree planting in an experimental way has been done by Mr. H. Isenberg at his mountain house, Kukaua, elevation 1000 feet, and the following varieties found doing well there:

Eucalyptus citriodora (Lemon Gum)—Doing very well.
Eucalyptus rostrata (Red Gum)—Doing very well.
Eucalyptus amygdalina—Doing very well.
Grevillea robusta—Doing very well.

Cryptomeria japonica—(Japan Cedar)—Doing very well in higher elevations.

Acacia melanoxylon (Black Wood Tree)—Doing very well mauka and makai.

Poinciana regia—Doing well makai only.

Laurus camphora (Camphor tree)—Doing very well.

Those found not doing so well are *Acacia molissima* and *Acacia decurrens* (Black Wattle).

Cryptomeria japonica especially, is a very promising tree, producing valuable building material and being easily propagated from slips. From about six trees planted in 1901 there are now 500 growing, the largest being 15 feet high.

Lihue Plantation Company has also planted trees for a wind break, consisting of about 100,000 Ironwood trees, between their cane fields and the sea, and extending from Nawiliwili Bay to the Wailua Flats, or a distance of about four miles. These trees have to be irrigated occasionally, and are growing fast. Total area of trees planted is about 1000 acres.

Forest Nurseries—The young trees for these plantings have been started either at the gardens of Mr. Isenberg, Mr. Wilcox or the writer.

Native Forest—Our native forest has been fenced off since 1894 and stock kept out, and has since recuperated astonishingly well. Thousands of Ohia Lehuas have sprung up and attained a height of 20 feet.

For future planting I recommend all the varieties mentioned, to be planted in their respective favorite elevations.

At the beginning of the year I noticd a small catrpillar destroying the seeds of the Koa trees and also the buds on the young shoots.

Respectfully submitted,

F. WEBER,
Consulting Forester.

REPORT OF REV. J. M. LYDGATE.

Koloa—Kauai.

The forest region of the District of Koloa, Kauai, is almost wholly included within the estate of the McBryde Sugar Com-

pany. This company is intelligently awake to the vital importance of protecting their forest area. The more so that water is the essential factor of success with them, and flowing mountain water is vastly cheaper than pumped water. Accordingly they have taken steps to set aside and fence the mountain region as a forest reserve. They will construct a substantial fence some five miles in length from the Piwai ridge, back of Koloa, to the Hanapepe Valley, and will carefully remove all cattle from this reservation. It is expected that this work will be completed in a few months.

On the lower lands, on the sides of valleys and other waste lands, a beginning has been made in the way of forestry, mainly for fuel purposes, both by the Koloa Plantation Company and the McBryde Sugar Company. Mr. W. D. McBryde has also begun a very commendable personal work in the way of tree planting.

J. M. LYDGATE.

REPORT OF MR. FRANCIS GAY.

Waimea—Kauai.

MAKAWELI, Dec. 9th, 1904.

In reply to your letter of the 3rd inst. I beg to report:

Planted Forest.—Prior to 1880 there was no forest on the low lands of this district, but about that time the land-owners planted Algaroba trees in many places and there are now hundreds of acres of land covered with these trees, which are now a source of income to the owners, both as fuel and fodder.

Forest Nurseries.—There are no forest nurseries at the present time in the district, as the Algaroba is the only tree that has been found suitable for this locality and it does not require nurseries.

Native Forest.—The condition of the Native Forest is better than it was some years ago, owing to the efforts of the land-owners to rid the land of wild cattle and goats, and I find in many places that young trees are now growing.

I have noticed no damage to the forest from insects during

the last year, but have observed in many places that Lantana is choking out forest trees.

There has been no utilization in our district of the products of our Native Forest.

Yours truly,

FRANCIS GAY.

REPORT OF MR. W. F. DILLINGHAM.

Ewa and Waianae—Oahu.

HONOLULU, HAWAII, Dec. 29, 1904.

Referring to your letter of December 3rd, I would say:

Planted Forest.—Within the Ewa District I find that nothing has been done in regard to planting the forest, but I have learned from the manager of the Honolulu Plantation, Mr. James A. Low, that just so soon as the work is taken up and the mountain fences back of the Honolulu Plantation completed according to the plan as outlined in my original report to the Governor, the Honolulu Plantation is ready and anxious to start in the foresting of the hillsides in that locality.

Forest Nurseries.—Two years ago a forest nursery was established on the lower end of the Waianae Range. By referring to the forest map, which was submitted by me with my first report to the Governor, you will note an irregular jog at the southwestern corner of the Waianae Reservation. The jog represents some five hundred acres. H. M. von Holt, Superintendent of the Oahu Railway and Land Company ranches, has started a nursery at this place. The elevation is about 2,000 feet above sea level. Trees of various kinds, secured from the Government Nursery, have been set out and about five acres planted. Within this reservation of 500 acres he has set out some 2,000 trees of various imported varieties and about a thousand Kukui trees. Mr. von Holt reports that in addition to these trees, some 3,000 young Koa trees are springing up from old roots and dropped seeds. Two men are employed in caring for the trees. These men once or twice a week make a tour of the ridge with rifles to drive the goats away. The results of this work are most encouraging, as it is already noticeable that the springs,

of which there are quite a few in this locality, are increasing. In some cases where a few years ago there was simply a marshy or boggy spot, now there is a pool, and in one case a small stream is flowing. The Algaroba forest, which ten years ago was limited to the rocky land extending back from the sea coast a few thousand feet, now spreads over the foothills back two or three miles and to an elevation of 1800 feet. The starting of a forest at this section of the district is much more easily accomplished than on the Koolau Range and with a little assistance and a continuous effort to keep the goats from off these peaks, I believe that several thousand acres can be reforested in a comparatively short time.

Native Forest.—There is very little left of the native forest on the Waianae Range, but on the Koolau section of this district there are many hundred acres in comparatively rank growth. The forest fence which was constructed a number of years ago, extends from the boundary of Waianae Uka across Waipio, Waiawa, Manana, Waimano and Waiau. The cattle have been practically excluded from the section between this fence and the summit of the range and while the forest is slow in replanting itself on the ridges, due to the fact that the Hilo Grass is so closely matted as to make it practically impossible for the seeds to reach the soil, the valleys are once more in their natural tropical jungle state. I believe that it would not require a very great effort to secure assistance in extending this forest fence from Waiau across the lands of Waimalu, Kalauao, Aiea and the two lands of Halawa. As soon as this fence is completed we could look to the Honolulu Plantation to start in work on foresting the Kalauao, Aiea and Halawa lands.

I have recently made an experiment of planting out the seeds of the Australian Black Wattle and from the number of seeds which have sprouted, I believe that this tree will be one of the most satisfactory and economical to start on the barren ridges which divide the gulches in this section of the country. It seems necessary to set out some quick, hardy growing tree for a start as until some shelter is growing, it will be impossible to plant most of the jungle trees on these wind swept ridges. I would suggest that a good plan would be to set out rows of these trees along the proposed lower boundary of the forest reservation so that by the time the first fences were gone the trees could be

used as fence posts either as they stand or by cutting and making regular fence posts of same, in either case reducing the cost of maintaining fences very materially. If there is one of the varieties of the Eucalyptus trees which starts well from seed this would probably prove a valuable tree in starting forest reservations or nurseries.

I regret that the Ewa District cannot report greater progress in the forestry work, but trust that some concerted action in the coming year will be taken by the plantations towards reforesting these hills.

Yours truly,

W. F. DILLINGHAM.

REPORT OF MR. A. M. NOWELL.

Waialua—Oahu.

WAIALUA, OAHU, Dec. 20, 1904.

In compliance with your request to furnish you with a statement of the forestry work in the Waialua District for the year 1904, I would say that this statement will of necessity be brief as there has been little or nothing done as yet to establish a system of forestry here. This has undoubtedly been due to the fact that other districts have been much more in need of the application of the principles of forestry than has Waialua and so have naturally demanded the greater part of the attention of the Board. My remarks, therefore, will be confined to a short description of the natural characteristics of this district.

The territorial district of Waialua comprises in all about 77,000 acres and extends from Kaena Point on the west, east along the Waianae Range to a point north of the Leilehua Ranch, across the Waialua table-land to the Koolau Range including the settlement of Wahiawa, thence northwest along the Koolau Range to the sea at Waimea.

Native Forest.—Of these 77,000 acres approximately 23,000 acres are in forest, the remainder being pasture land, cane land, rice land and kuleanas. This 23,000 acres is all native forest and as far as injurious insects are concerned is not suffering

to any great extent. There is need, however, in some sections of systematic cutting and the product can be easily and I believe profitably disposed of as fuel. About 18,000 acres of this forest land is in the Koolau Range, the other 5,000 being in the Waianae Range; the first named being by far the more important of the two, as it contains the head waters of six distinct streams, while the Waianae Range on the other hand is productive of no streams flowing into the Waialua District.

Rainfall.—The rainfall in this district at about sea level in the past four years has varied to a considerable extent viz.: in 1901, 35 inches; 1902, 27 inches; 1903, 16 inches; 1904, up to the time of writing, 69 inches, or an average of about 37 inches per year. There has been considerably more rain than this on the higher lands.

In conclusion I would say that I hope and expect by the end of next year there will be something definite to report in regard to the forest reserves, nurseries and planted forests.

Yours very respectfully,

A. M. NOWELL.

REPORT OF MR. ANDREW ADAMS.

Koolauloa—Oahu.

Mr. Andrew Adams, District Forester for the Koolauloa District, desired that no formal report for him be published, but in correspondence he stated that "The Plantation is constantly planting Ironwood trees, which are thriving, but no systematic effort has been made toward forest planting, in fact the little planting that has been done could scarcely be dignified by the term 'forestation.' There are no forest nurseries, except several boxes on the premises of the head luna and my own where Ironwood trees are started from seeds.

"The native forest in the mountains is in good condition, and the Koa, of which there is a good belt between Malaekahana and Kaipapau valleys, is vigorous and thriving. The insect usually preying upon the Koa is not so much in evidence in this forest, it appears to me, as formerly, and there are many young Koas springing up; some of this is sizeable timber, but

I doubt if it could ever be lumbered without great destruction to the surrounding forest, and especially the undergrowth, because of the almost inaccessible ridges on which the Koa stands.

I regret that more has not been done in the district in a definite way, but I trust that I shall be able to report to you very soon an arrangement which will insure the shutting out of cattle from a considerable area of forest in this district."

REPORT OF MR. JOHN HERD.

South Koolaupoko—Oahu.

MAUNAWILI RANCH, WAIMANALO, Dec. 15, 1904.

In compliance with your request I herewith submit a statement of forest conditions for past year:

Trees Planted Out.

Casuarina equisetifolia	3875
Grevillea robusta	519
Acacia melanoxylon	18
Parkia africana	1008
Eucalyptus robusta	210
Alligator Pears	46
Mangoes (Manila and Chutney)	150
Kona Orange seedlings	90
Papaya	55
Pride of India	250
	6221

This makes a total of 14,910 trees planted out since our nursery was started here in October, 1902.

The chief object in planting these trees has been to provide wind breaks for coffee fields. At present time we have started fencing in about ten acres, where there are a few old native Koa. We intend filling up this lot with young Koa trees from nursery next spring.

In nursery at present time are seedling beds of *Grevillea robusta,* native Koa, *Casuarina torulosa,* Royal Palm, *Eucalyptus citriodora* and seedling oranges and lemons.

There are no nurseries in this district other than this one on the estate.

The native forest in this district, which at best is confined to ravines and gulches, is not making any increase, it being in many directions open to range cattle, which keeps down young growth. The rapid growth of Guava has also, in a number of places, killed out the Ohia in the ravines and elsewhere.

The Alligator Pear here are attacked by a borer which has killed out all of our best trees.

Respectfully submitted,

JOHN HERD.

REPORT OF MR. L. L. MCCANDLESS.

North Koolaupoko—Oahu.

HONOLULU, T. H., Dec. 19, 1904.

In reply to your communication of the 3rd inst., requesting of me as Consulting Forester a short statement as to forestry conditions in my district, I beg to say that in the district which you desire me to report on, viz: Koolaupoko, there are no planted forests and no forest nurseries. In reference to native forests, I would say that the same appear to be generally in a good condition, though a small area has been somewhat injured by fire during the past year.

There is no marketable timber, the Koa being scrubby and other trees small. The Ironwood has been planted by some of the residents of the district and I find that it thrives well. The Alligator Pear does well but this year a worm has attacked and killed a few of the trees. The Monkey-pod, self-planted, is springing up in many places and is doing well.

I would suggest, for the preservation of the Mountain Forest, that the same be fenced and some means provided prohibiting graziers from setting fire to pasture land which too frequently extends into the Mountain Forest.

Respectfully submitted,

L. L. McCANDLESS.

REPORT OF MR. BOLTE.

Middle Koolaupoko—Oahu.

The Ohia and Kukui forests, on top of the Nuuanu Pali Mountain and Mount Konahuanui, are very clearly visible from our side, but they do not belong to our side, they are portions of the Nuuanu Valley forests. Further than those there is no forest between Ahuimanu and Maunawili, in the District of Koolaupoko, Island of Oahu. The mountain ridge, dividing the leeward side and windward side of Oahu, drops not very far from perpendicularly on the Koolaupoko part of the windward side, thus there is not room for a forest on the mountain side.

Surrounding the water-springs, in crevices in the nearly perpendicular mountain side, grow, unfenced, on top of the mountain spurs, a number of fair sized slumps of trees, mostly Kukui. At Heeia there has been fenced off, since a number of years, one of the valleys, to protect the trees in it and for the purpose of raising a little forest. The trees in this valley grow well, but not any better than the clumps of Kukui trees, which have a strong natural protection in the many sharp edged rocks that cover the ground in which they grow. Thus, what trees there are, are well protected; they are all growing well and have strong undergrowth protecting the water-springs. There have been no forest products from these native trees.

Planted forest and forest nurseries there are none here, unless Guava be considered such. If Guava had been left undisturbed from the beginning, it might by this time have made a forest covering over all the land in Koolaupoko. Not that I am hankering after any Guava forest, very much to the contrary, I wish we had never seen any Guavas on the Hawaiian Islands. As it is now Guava bushes cover large areas, making the land nearly as unfit for any use as Lantana does. It is to be hoped that after not too long a time our busy Entomologists will be able to find time to give their attention to Guavas and that they may be successful in discovering an insect which will eat nothing but Guava blossoms. From Guavas there has been a little forest-product in the shape of firewood and charcoal.

I do not consider it necessary to have any particular Forest Reserve in our part of Koolaupoko. I think the clumps of

trees, as they are now, are just about right and enough reserve for the protection of the water-springs.

Silk Oak grows well here and would probably make a valuable forest tree, but before being able to plant a forest of Oak, the present sort of a forest, Guava, would first have to be gotten rid of. Besides that, most of the lands here are held by lessees, and forests are something for land-owners to plant.

C. BOLTE.

Heeia, Dec. 20, 1904.

REPORT OF HON. PAUL R. ISENBERG.

HONOLULU, T. H., Jan. 27, 1905.

In response to your communication to me of December, I have really no report to make of the Division of Forestry under my supervision. I would state though that it gives me great satisfaction to inform you that the Algaroba trees are climbing up the valleys and are in a great many instances thick forests. I notice also that this tree is growing at a much higher elevation than it used to, and I hope that in years to come a great many of the lands which are now poorly covered with trees will be dense forests.

I should very much like to go over our forest lands with you at some date to be arranged between us, so that we could get some idea of what recommendations to make to the different land holders. I for myself think that all forest lands should be fenced off, and am ready to look into this matter with you.

Yours very truly,

PAUL R. ISENBERG.

REPORT OF MR. G. C. MUNRO.

Island of Molokai.

MOLOKAI RANCH, Dec. 31, 1904.

There is no large area of planted forest on Molokai; plantations consisting of small groves have at times been planted.

The American Sugar Company have experimented to some

extent with planting useful and shade trees on semi-dry lands exposed to frequent high winds, and a few thousand trees have been planted yearly, the plants being raised in this nursery but, on account of the adverse conditions, quite a number of the trees die before they get sufficient hold to resist the dry season and the wind. More success has attended planting on the borders of the wetter region on the mountain.

There has also been some experimenting with little success in foreign forest trees suitable for the wet mountain. Seeds and cuttings were furnished through Mr. Jared G. Smith of the United States Experiment Station but so far none have shown to be suitable. There is great need of some self-spreading, quick growing, useful forest trees to mix with the Ohia which is the general forest here.

The tree giving the most satisfactory result so far is the Swamp Mahogany, *Eucalyptus robusta*. Plants are easily raised from seed and there is little loss in planting out; the trees grow quickly and resist the wind and drought; and the wood will likely prove useful for fence posts.

Grevillea, Ironwood, Black Wattle, Blue Gum and others of the Eucalyptus have also been grown, but Swamp Mahogany has given the best results.

Some Mangroves, also procured through Mr. Jared G. Smith, have been planted on the mud flats along the coast and are growing vigorously.

The Algaroba forest extends in a narrow belt about twenty miles long along the southern coast and is rapidly extending up the valleys and slopes and even on to the elevated plains.

The American Sugar Company have a forest reserve of from 8,000 to 10,000 acres, a great part of which is denuded or partially denuded forest land. It includes part and adjoins the rest of the remaining forest. Stock has been excluded from this area for several years and there has since been an astonishing growth of underbrush and young trees and it is evident that the partially denuded parts will in time be fully reafforested. About a third of the American Sugar Company's land so reserved could with advantage be kept as forest and stock excluded, but the remainder could be utilized for more useful purposes and planting continued on them at the same time.

The great need in the Molokai forest is an admixture of large useful trees with the present prevailing Ohia.

G. C. MUNRO.

REPORT OF HON. H. P. BALDWIN.

Kaanapali—Maui.

Mr. Baldwin preferred not to make a regular report, but in correspondence in regard to the proposed Koolau Forest Reserve, said:

"As you probably know, we have been at work now for some time on a line of fence to enclose the Forestry Reserve, as approved by yourself and Governor Carter.

"The makai boundary of the Forestry Reserve, from and including the Opana land, not far East from Haiku, through on the line as agreed upon, to and including a greater portion of the Nahiku land, will soon be finished, so that it will be practically impossible for animals to range mauka of this line, excepting in the region of Halehaku and Peahi, where the natives own land on the mountain side of the proposed line. We will, however, run a fence mauka of the land that the natives own, so as to prevent stock from getting into the Forestry Reserve in this locality. The fence through Opana, and a portion of Halehaku, was constructed a good many years ago. From there on, to and including Nahiku, the fence is new.

"We expect this winter to start trees for reforesting portions of the Forest Reserve that have been denuded of trees. The trees that we have so far planted, for forestry purposes, on land that we own on the East side of Haiku, are the Grevillea, Eucalyptus, Ironwood and Java Plum.

"We start our own trees in small nurseries on our plantations, and purchase them of the only nursery in this region, owned by James Lindsay, at Haiku."

REPORT OF MR. H. A. BALDWIN.

Hamakualoa—Maui.

PAIA, MAUI, Jan. 23, 1905.

The following is a report on what has been done in this district in the way of tree planting:

Winter 1897-1898.			
Near Piiholo	trees	20,884	
Haiku Mill	"	9,363	
Kailiili	"	11,354	
Haiku	"	8,520	
			50,121
Winter 1898-1899.			
Haiku Mill	"	10,826	
Piiholo	"	13,168	
Kailiili	"	20,000	
			43,994
Winter 1899-1900.			
Haiku	"	3,280	
			3,280
Winter 1900-1901.			
Haiku	"	9,654	
Opana	"	5,480	
Piiholo	"	2,959	
			18,093
Winter 1901-1902.			
Piiholo	"	9,595	
Haiku	"	1,812	
			11,407
Winter 1904-1905.			
Haiku	"	14,758	
Kailiili	"	4,556	
			19,314
Total			146,209

We plant about 15,000 more trees at Kailiili this year.

As a rule we intend to plant about 800 trees to the acre, but as some of the new planting is done among trees set out some years ago, the average number per acre is probably nearer 500 trees. More than half of these are Eucalypts, mainly Blue Gum. Of the rest, the Ironwood forms the greater part. This tree is doing very well, as are also the Golden and Black Wattles, especially the former. The Silver Wattle seems to be very short lived.

The *Acacia melanoxylon* or Black Wood is doing very well also. The Grevillea is a very proimsing tree, growing well at all altitudes so far tried. A few specimens of Turpentine are doing exceedingly well, and I think will prove a valuable addition to our forests.

The sugar plantation here has planted considerable quantities that do not appear in the above report, being on the eastern side of Maliko Gulch, and in Mr. von Tempsky's district.

Respectfully submitted,

H. A. BALDWIN,
Hamakualoa, Maui.

REPORT OF MR. L. VON TEMPSKY.

Makawao and Kula—Maui.

MAKAWAO, MAUI, Dec. 17, 1904.

Forestry in the District of Makawao.

I regret to say that very few of the residents of this district fully appreciate the destruction that is going on in the forests of this island; and still fewer are making any attempt to remedy the disastrous effects that are bound to follow, when the forests on the slopes of Haleakala are a thing of the past.

The Maui Agricultural Company, of which Mr. H. A. Baldwin is the manager; the Hawaiian Commercial and Sugar Company, with Mr. H. P. Baldwin at its head, and the Haleakala Ranch are about the only ones in this district that are doing any real work in the tree planting line.

The Maui Agricultural Company has in the last few years planted about two hundred acres of land in trees, principally *Eucalyptus globulus,* with a few *Grevillea robusta, Eucalyptus robusta* and Pride of India.

Their object in planting trees is to supply the camps with firewood; the oldest *Eucalyptus globulus* are about seven years old, and have attained a height of about forty feet. No wood has been cut yet, so no returns can be given.

The Hawaiian Commercial and Sugar Company has devoted itself to planting trees along its roads and water ditches; also

in clumps among the laborer's quarters. Their object in planting being to beautify the place, and make the lot of their laborers as pleasant in their homes as possible. They have planted in all, in the last two or three years, some 100,000 trees, all of which are doing well, and comprising the following species: Along the roads, *Grevillea robusta, Poinciana regia, Casuarina* and Java Plum; among the quarters, Papaia, Java Plum, Alligator Pears, etc.

The Haleakala Ranch has planted in avenues along its roads and in groves scattered through its paddocks. Object to beautify the place, and afford shelter for the stock.

The groves vary in size from five to eighteen acres, and the trees run about two hundred to the acre; the groves are planted at from 2000 feet elevation to 5500 feet. At the 2000 foot elevation the following species have been tried: *Eucalyptus globulus, E. robusta, E. rostrata, E. citriodora, E. leucoxylon, E. amygdalina, Grevillea robusta, Cupressus macrocarpa,* Pepper Tree, Linden, Ash, Birch, Maple, Black Locust and White Locust, Copper Beech and Tulip Tree. All of these trees would grow well at this elevation were it not for the "Olinda Beetle" (as it is known here), which has destroyed completely all except the *Eucalyptus globulus, E. robusta, Grevillea robusta,* Pepper Tree, *Cupressus macrocarpa* and Tulip Tree.

At the 5500 foot elevation the same species have been tried with the exception of the Tulip and Pepper Trees, and the addition of the Silver Poplar, *Sequoia gigantea,* White and Yellow Pines.

The oldest trees on this ranch, planted by the writer, are five years old: *Eucalyptus globulus, Grevillea robusta,* the former having reached the height of forty feet and the latter about thirty-five feet.

The seeds are planted first in boxes, and at the age of about two or three months are set out in their permanent homes, costing at that time about three cents per tree. None of these trees have been cut, therefore can give no figures on returns from cuttings.

There are no forest nurseries in the Makawao District outside of those of the Hawaiian Commercial and Sugar Company and the Haleakala Ranch.

The condition of the native forest, where it has been fenced up and protected from cattle, is very satisfactory. Land that a few years ago (before being fenced) one could ride through on horseback with ease, is now such a tangle of young trees and undergrowth that it is next to impossible to get through on foot, and were it not for some insect that destroys the young Koa, Ohia, Mamani, etc., I think the forest would soon resume its primeval aspect. An importation of some bird that would destroy this insect, in some of its numerous forms, would be of immense assistance to the native forest.

In connection with the future reforestation of this Island I may state than at an elevation of 4000 feet the *Eucalyptus globulus,* aged about thirty years, are reseeding themselves to such an extent (in spite of what the cattle do to prevent their growth) that in a short time the young trees will have to be thinned out in order to be able to ride through.

Any intelligent man can see from this what the future of the *Eucalyptus globulus* will be in forty or fifty years. The same is going on at Ulupalakua with the *Eucalyptus rostrata,* at an elevation of 2000 feet.

In Kula at from two to three thousand feet the common Wattle is performing the same work. This tree, however, is very short lived, owing to an insect that bores innumerable minute holes in the bark, which causes the tree to bleed to death. This insect is of comparatively recent advent, as I remember very fine old Wattles at Ulupalakua, that were said to be over thirty years of age. Ten to fifteen is now about their limit.

On the commons of Kula the Algaroba is spreading rapidly, growing up to the 2500 foot elevation; of course, however, not growing there so fast as it does further down.

This autumn I have noticed also there for the first time the growth of the beautiful native shrub "Ohai." I have been over these commons for the past twenty-five years, and this is the first time I have either seen or heard of it in this locality; in fact, the natives who were with me when I saw it first (one of them an old man) didn't even know its name and thought it was a haole tree.

L. Von TEMPSKY,

REPORT OF MR. L. BARKHAUSEN.

Lahaina—Maui.

LAHAINA, MAUI, Dec. 8, 1904.

In reply to yours of the 3rd inst., I beg to state that the only steps in regard to forest preservation in this District have been taken on the land of, and by the Pioneer Mill Company, Limited, by fencing off the watershed at approximately 2000 feet elevation. This has proved very effective, as is demonstrated by the fact that the land makai of the fence has been entirely denuded of forest by cattle, while the mauka side shows an abundant growth of native trees, ferns, etc.

I have not noticed any insects or blights doing noticeable damage to the forest.

So far nothing has been done here in the way of planting new areas with trees.

Yours very truly,

L. BARKHAUSEN.

REPORT OF MR. C. B. WELLS.

Wailuku—Maui.

Mr. Wells had no formal report to make, as nothing had been done in his district toward forestry during the past year.

In conversation with the Superintendent of Forestry Mr. Wells stated that the Wailuku Sugar Company were prepared to protect the forest in connection with their proposed irrigation projects and that he was awaiting a visit from the Superintendent of Forestry for recommendations as to what should be done.

REPORT OF MR. E. E. OLDING.

North Kohala—Hawaii.

KOHALA, HAWAII, Dec. 16, 1904.

I submit herewith the following report on Forestry for this District:

Planted Forest.—The area planted in the District of North Kohala approximates 200 acres. The plantations are in small plots, varying from one acre to fifty acres, and from one to twenty years old, the object being to produce fuel and protect the cane fields from the high winds which prevail here during the greater part of the year.

Varieties Planted.—The varieties planted are principally Ironwood, Lavender and Blue Gum and Black Wattle. All of these varieties grow rapidly and reach a height of from thirty to forty feet in twelve to fifteen years, with a diameter of six to twelve inches.

Many other varieties do well, especially the Algaroba or Mesquite, which grows on the lower lands near the sea coast. The nursery work, clearing land and terrace planting and the care of young trees during first three years, costs approximately one hundred dollars per acre.

Planted six feet apart, or say 1210 trees per acre, this will yield in from twelve to fifteen years fifty cords of fire wood. The value of this, uncut, would be about six dollars per cord, or three hundred dollars per acre.

Forest Nurseries.—The forest nurseries are small and have a capacity in all of about 10,000 seedlings.

Native Forest.—Where this is unprotected from cattle it is rapidly disappearing. The natural conditions under which the native forest is produced being destroyed leave the trees still growing in a weak condition, so that they quickly fall a prey to any insect pests attacking them, and the thick matting of grass which follows the destruction of the fern growth prevents the seeds from germinating and taking root, so that in a few years the forest will be totally destroyed.

Where the native forest is protected from cattle, reproduction is normal and it is otherwise in a healthy condition.

Forestry in General.—The Planting of Algaroba trees on the waste and rocky areas along the west coast of this District would in time prevent the great radiation from this barren waste and would tend to reduce the velocity of the trade winds on the northeast side blowing from the sea.

Much more could be done in this district which would be of service, both from an economical and artistic standpoint, by

planting the waste lands and steep sides of ravines with trees, where at present nothing of value grows.

The trees already planted along the road sides and in waste places now make Kohala one of the most picturesque districts in the Hawaiian Islands.

Respectfully submitted,

E. E. OLDING,

REPORT OF MR. F. W. CARTER.

South Kohala—Hawaii.

KAMUELA, HAWAII, Dec. 16, 1904.

As per your request of Dec. 3rd I beg to report as follows:

The Parker Ranch has planted out on Government land, under lease to them this year, 735 Eucalyptus and Silk Oak trees, besides furnishing to outside parties 1831 trees of different varieties, over 200 of these being planted in the Courthouse yard and School premises.

The Ranch has on the Puukapu land made a reserve of 320 acres, which is fenced to protect the water head of streams and springs. This is known as the Haloa reserve. In fencing this reserve it virtually shuts out the cattle from the forest on the southeast side of Haloa hill and above the Kukuihaele reserve. I estimate there are only ten head of stock in there at present and they are being worked out as fast as possible. In these reserves the fern growth and Ohia trees are coming finely.

There is also a reserve on the land of Waikoloa, which is in the dry belt, which contains 6500 trees. It is too early yet to report which varieties do the best there.

There is also a reserve of 640 acres on the land of Paauhau to protect the Waiakamakapo Spring. No planting done there, this land was run over by the fire of 1901 and has been fenced over two years; the young Koa are coming on nicely, grasses and o-i very thick, no fern growth.

There have been put out of the nursery so far 13,253 trees.

At present time there is in the nursery 14,000 young trees.

In Waimea, on the Government land, there have been 500 holes prepared and only awaiting a rain to set out the young trees.

I recommend that as soon as possible the forest on the Kohala side of Waimea be protected, as I explained to Mr. Hall some time ago on his visit here, and also to you upon your first visit here.

Respectfully submitted,

F. W. CARTER.

REPORT OF CARL WILLING, NURSERYMAN AT THE PARKER RANCH.

The following report from Mr. Carl Willing, the Nurseryman employed by the Parker Ranch, may well be inserted in the report for the Kohala District:

WAIMEA, HAWAII, Nov. 1, 1904.

To MR. E. E. CONANT,
RECEIVER PARKER RANCH.—

I hereby present to you my report of the Nursery from November 1, 1903, to October 31, 1904:

After arriving in Waimea October 20, 1903, I started work erecting platforms, making seed boxes and the 1st of November sowing out the first seeds.

On January 15th I planted the first trees in the ground outside of Puuopelu.

On February 11th I received from San Francisco via Honolulu the following fruit trees:

	Trees.		Trees.
Grapes	48	Plums	60
Almonds	12	Naval Oranges	12
Walnuts	12	Lemons	12
Cherry	12	Peaches	12
Apricots	12	Currants	6
Apples	12		

In all 228 trees.

I planted these trees in the following places:

	Trees.		Trees.
Mana	32	Manager Carter's place	32
Waikiki	82	Lot on Kohala Road	28
Puuopelu	38	Keamoku Sheep Station	16

I planted in every place a mixed variety.

On March 21st I began planting within the Stone Wall, which I continued till the place was filled, planting in all 8500 trees, of which 2000 were lost..

Between the time of planting in the Stone Wall I made holes in the inside lot of Puuopelu and planted 443 trees there. On the outside the amount was 735, making a total of 1180. Of these I only lost 12 per cent, replanting 126 trees.

I planted in paddock next to Ranch stables 695 trees; in Ahuli 762 trees; at Keamoku Sheep Station 85 trees; at Waikii 200 trees, making a total planted out on Ranch property, 11,422 trees.

The following were given away:

	Trees.
To Mr. Carl Widemann	835
To Mr. Sam Spencer	787
To Sheriff for Courthouse yard	185
To Mr. Brightwell for School yard	24

Making a total of 1831 trees given away.

Total amount planted and given away, 13,253 trees.

At the present time there are 4000 trees in boxes, most of them ready to be set out, and 10,000 in seed boxes.

All trees that were set out had to be irrigated many times and kept clear from weeds.

Besides this outside work is the daily work. This consists of making new boxes, sifting soil, repairing old boxes, transplanting seedlings, watering and keeping clean from weeds, and on hot days giving them shade for a couple of hours.

Below I give you a list of seeds which I received during the year.

On account of this high elevation I lost thousands of seedlings that were not adapted to this climate. This loss can be avoided in future and I can set out double the number of trees and more, the coming year.

SEEDS RECEIVED DURING YEAR.

Eucalyptus globulus.
" *resinifera,* valuable for posts, does well.
" *citriodora,* valuable for posts, does not do well.

Eucalyptus botryoides, valuables for posts, does not do well.
" *corynocalyx,* valuable for timber, does not do well.
" *corymbosa,* valuable for timber, does not do well.
" *crebra,* seed was old, never sowed.
" *goniocalyx,* valuable for posts, does well.
" *hemiphloia,* valuable for posts, does well.
" *haemastoma,* valuable for posts, does well.
" *polyanthema,* valuable for posts, does well.
" *rostrata,* best wood for underground.
" *saligna,* valuable for posts, does well.
" *siderophloia,* valuable for posts, does well.
" *tereticornis,* valuable for posts, does well.
" *viminalis,* valuable for posts, does well.
" *amygdalina,* a very large tree.
" *robusta,* valuable for underground.

Eucalyptus amygdalina lately received from Mr. Hosmer is said to be the largest tree on earth; more like the California Redwood, and good for the same uses, for shingles, rails, planking for ships and bridges.

Acacia dealbata (Silver Wattle), doing well, valuable.
" *decurrens* (Black Wattle), doing well, valuable.
" *latifolia.*
" *lineata.*
" *mollissima.*
" *elata.*
" *longifolia.*
" *baileyana.*
" *oblonga.*
" *wichta.*
" *rutritra.*
" *tiscolor.*
" *suaveolens.*
" *lopantha.*
" *obtera.*
" *melanoxylon,* Black Wood tree, valuable and doing well, growing as fast as *Eucalyptus.*

Catalpa speciosa, valuable, does not do well.
Pinus ponderosa.
Pinus tuberculata.

Cryptomeria japonica, seed was old, did not sow.
Syncarpia laurifolia, doing well.
Grevillea robusta, doing well.
Casuarina quadrivalvis, doing well.
Dalbergia sisso, doing well, want shelter.
Macadamia hillii, valuable wood, nut tree.
Ceratonia selliqua (carob), pods, valuable for cattle, doing well. This tree should be more planted. The seeds I had were old, only a few grew.

Quite a number of other varieties were lost on account of cold weather.

List of seed I have lately received from Mr. Hosmer and am sowing out in boxes; will be reported later:

Albizzia stipulata.
Casuarina glauca (Ironwood).
Bombax ceiba (Silk Cotton tree).
Dalbergia sisso.
Sesbania tomentosa (Ohai).
Parkia africana.
Tectonia grandis (Teak).
Pinus coulteri.
" *attenuata.*
" *lambertiana.*
" *jeffreyii.*
" *insignis* (Monterey Pine).
Pseudotsuga macrocarpa (Big Cone Spruce).

Yours truly,

CARL WILLING.

REPORT OF DAVID FORBES.

Hamakua—Hawaii.

HAMAKUA, HAWAII, January 14, 1905.

It is with a feeling of regret I have to report but small progress made in this district toward the reclaiming of the denuded or fast deteriorating forest, during the year just closed. Neighboring districts have made great advances. Hilo, as well as Kohala, have had their reserves established, while but a small sec-

tion of Hamakua has come in for consideration, viz: that strip of land lying between the valleys of Waipio and Waimanu, the location of which makes it of but little value as a forest reserve to the agricultural interests throughout the District. As against this concession I infer from late press notes that a section of the most valuable and necessary timber belt is likely to be turned over to the tender mercy of a rancher, and get its destruction completed at no distant date. The land referred to is Kaohe, in Eastern Hamakua, part of which was ruined by fire a few years ago.

No doubt all of the sections which have come under the consideration of your Board and Government in the districts enumerated require all of the forest remaining in their neighborhood, but none more so than Hamakua from the west boundaries of Ookala to the eastern slopes of Kohala Mountains, at base of Pualala and Kaala peaks. The casual observer cannot fail to notice, on riding along the upper boundaries of homesteads and canefields, how narrow and scarcely furnished is the remnant of forest left on this belt, and a prophet does not require to leave his own country to here predict that there remains but a very few years, at present rate of destruction, between the completion of Waimea bare plains and the cane fields along our shores, bring one clear connection. Such conditions are much to be lamented, for undoubtedly the result to all valuable agricultural lands along the northern coast will be disastrous.

In tree planting but little is done. When I say little, I refer to the areas planted, compared with that which ought to be done. In this District Pacific Sugar Mill and Paauhau Sugar Company have been the pioneers in tree planting to any extent. On Paauhau Plantation, at an elevation of 1400 feet, there stands a planting of 50 acres in extent, composed chiefly of *Eucalyptus,* and planted some twelve to thirteen years ago. The trees have been planted with the object of making timber and rear into the air from 75 to over 100 feet, with clear stems, and can supply all of the fence posts or telephone poles necessary in that community for years to come.

Honokaa Sugar Company have more recently done considerable planting, partly in a solid body, but to a greater extent as hedge rows and on field borders. There a good example is

shown, of *Grevillea robusta,* grown in a belt as wind break, in which position it seems to meet the requirements, and produces timber wonderfully rapidly. Hamakua Mill Company and Kukaiau Plantation Company have also done tree planting, but on a smaller scale than any of the above.

A number of the homesteaders have planted trees, looking to the future benefits to be derived, and shown good judgment in their selection of varieties and management of distribution, although much the larger percentage have planted but few trees apart from coffee and fruit trees, which as forest does not here come under consideration.

Pacific Sugar Mill, for the past 18 or more years, has taken an active part in forest reservation and planting, perhaps one of the most interesting experiments and least known is that of Cinchona trees. A clearing of some 13 acres planted 4′ x 4′, but now thinned to 8′ x 8′ apart, composed chiefly of two varieites, the *C. ledgeriana* and *C. officinalis,* although numbers of the *C. succirubra* and Grey Barks are included. In Ceylon the barks of these varieties run from 10 to 16 per cent of Quinine; these trees, it can be seen, unlike our sugar cane are grown for the percentage of bitterness contained, and their value based accordingly. I may here add that this experiment was carried out seventeen years ago, when the prices of Quinine ran high, since which date other drugs have come on the market to, in a great measure, supplant its consumption, reduce its cost, and practically put Cinchona supply in the hands of South Americans, "Cascarillas," who draw their barks from the natural forests of Peru and adjoining countries, in sufficient quantities, and lower prices than would justify an attempt at its culture as a paying enterprise.

Here another enclosure of some 10 to 12 acres in extent is planted to exotic trees of great variety, comprising Eucalypts of many sorts, Casuarinas in variety, Acacia ditto, *Grevillea robusta, Cupressus macrocarpa, C. lawsonia, Cryptomeria japonica, Artocarpus integrifolia* (Jack Tree), *Camphoria officnalis,* Auracaria of sorts, etc. A smaller enclosure at 300 feet elevation has been planted ten years ago to Java Plums and Casuarinas; the Casuarinas to remain as standards when large enough, the plum trees to be cut out in order to give them sufficient height and space.

Each year a number of trees are planted along the roadsides, field boundaries or waste and rough patches, where agricultural implements cannot be successfully operated. Within the past two years several thousands of seedlings have been planted in forest clearings above the 2000 foot elevation. This undertaking, however, has so far been a failure, for so soon as the trees have got established, that pest known here as "Olinda Beetle" comes along and stays by his work until nothing is left but a leafless stem. His taste being cultivatd to a high degree for exotic plants, nothing seems to upset him from the common Guava to the Blue Gum leaves.

In the work of tree planting general utility should never be lost sight of, while the purpose for which the tree is intended is of first consideration. During the writer's experience of seventeen years in Hamakua climate the following trees for various purposes have given best results. On lower, dry and exposed lands the *Casuarina quadrivalvis* is good for shelter or wind belts, yielding to the wind and again returning to an upright position. This, with its deep rooting characteristic make it admirablly suited as a wind-resister. When closely grown this variety of Ironwood makes a quick growing and handsome timber tree, or when thinly grown makes an equally handsome and ornamental tree. Next in order for wind belts or shelter the *Grevillea robusta* gives greatest satisfaction, but best results are obtained from this variety when grown in belts not less than 50 feet in breadth. An important feature, not to be lost sight of, is that other crops will grow and thrive, within a few feet of either of the varieties above mentioned.

As all around timber trees, for rapid growth and general usefulness within a limited number of years, the *Eucalyptus citriodora, E. robusta, Grevillea robusta,* and *Casuarina quadrivalvis* are the four best varieties of all our exotic trees, which have up to this date had sufficient time to demonstrate their adaptibility to our climate and soil.

Just recently the writer had occasion to thin out a number of trees from a planting seventeen years of age and by measurement at 35 feet from the butt a number of them squared 12 inches, towering up 130 feet in the air; those trees are grown at an elevation of 700 to 800 feet. Such timber has considerable value on a plantation and is utilized for such purposes as plow-

beams, wagon poles, wheel-spokes, etc., in fact, anything where a long grained, hard and elastic timber is required and substituted with better results in some cases, for our imported Oak, Ash or Hickory. For wagon-wheel spokes the Ironwood of variety mentioned has much to recommend it, while if grown as a timber tree it has another and valuable recommendation, insomuch that it is self reproducing and furnishes a coppice stronger than any other of our exotic trees.

The *Artocarpus integrofolia* is here a rapid grower and if planted for timber and to give quicker returns will supply a wood not inferior to our native *Acacia koa* for furniture or ornamental work, it having a close grain of dark brown color, and capable of taking a high polish. This tree is best adapted to the lower elevations and may not be considered suitable for the upper forests, nevertheless, if forestry is pursued on economical lines as well as adding to the amenity of our landscapes, there seems no reason why the Jack Tree should not share a place with our much admired, and deservedly so, Kukui tree, in adorning the ravines and sheltered corners along our coast line. Jack seeds are larger, have strength and vitality, and if scattered at random will wrestle for existence and usually come out on top.

Although our experience has been limited with the Araucarias there seems to be a future as forest trees for some of the varieties in that family, *A. excelsa, A. bidwillii* and *A. cunninghamii* are all rapid growers, which, together with *Cryptomeria japonica* offer a selection of conifers whose growing qualities are tested in this district at several elevations, showing no reason why, if grown extensively, the pine necessary for building material should not at some distant date be produced at home. The Japanese Larch I feel assured is a tree well worth experimenting with; it has been acclimatized to the warm shores of the Mediterranean and is now, even in more northern Europe supplanting the Italian Larch, so subject to the disease of Larch Blister.

A most encouraging outlook is offered at the nurseries of the Parker Ranch, and, although these nurseries are not in Hamakua proper, I cannot refrain from drawing attention to the thousands of healthy seedling, in all stages and of numerous varieties, the writer saw some months ago. The work of rais-

ing these trees, planting out, caring for and protecting them, is all done in a workmanlike and systematic manner. The various clumps and belts will, in the future, afford shelter and protection to the stock and so prove a valuable ranch asset.

In this general summary of conditions appertaining to Forestry, I have not attempted to get into conditions of the native forest in this district, and of which you are already familiar, and know how vital it is to our agricultural pursuits that a reserve should be created along the upper side of cane lands, as well as your having the power to keep the subject in foreground until some action is taken.

One suggestion I should like to offer in connection with importation of tree seeds, your Board being in touch with other countries can do so to better advantage than the private individual, both in cost and I believe also in quality. Such seeds as *Auracaria excelsa, A. cunninghamii, A. bidwillii,* Japanese Larch and *Casuarina quadrivalvis* I should be willing to take a few pounds at any time if you should entertain the idea, of course paying cost of same.

Trusting that the efforts made by you in the past year may be successful in establishing that interest so essential for the betterment of our Island forests and that in the words of Walter Scott, your motto may ever be the old Laird's advice to his son, John: "Be ye aye sticking in a tree, Jock, it will grow when ye are sleeping."

I remain, gentlemen,

Yours faithfully,

D. FORBES.

MR. GEORGE ROSS.

North Hilo—Hawaii.

The temporary absence of Mr. Ross from the Territory explains there being no report from his district. Mr. Ross is one of the most active of the District Foresters, and has done much for Forestry in Hilo.

REPORT OF MR. JOHN WATT.

Puna—Hawaii.

OLAA, HAWAII, Dec. 20, 1904.

Yours of December 3rd re. Forestry to hand and noted. In answer I beg to report as follows:

Planted Forest.—There is no planted forest in this District and very little tree planting of any kind has been done.

A number of fruit and shade trees have been planted around the houses, which have been built up within the past few years.

A few rubber trees have been planted on the homestead lot belonging to Mr. A. G. Curtis at Eleven Miles, on the Volcano Road.

These trees look exceedingly healthy and have attained a height of twenty-five feet. They were planted about four years ago.

Forest Nurseries.—There is no forest nursery in this District.

Native Forest.—The native trees, Ohia, Kukui, and Koa thrive well in this District. There are no injurious insects or pests attacking them.

None of these forest products are used to any extent commercially; the Ohia is used principally for fence posts, railroad ties and firewood.

Ohia railroad ties rot very quickly and are being replaced by imported lumber.

The cost of transporting Koa lumber prohibits its being used commercially.

Forests in General.—A great area of forest has been cleared away to make room for agricultural pursuits, but the Government should use every effort to create forest preserves.

I am a comparative stranger in this District and therefore am not informed upon what has been done toward forest preserves.

J. WATT.

REPORT OF MR. J. MONSARRAT.

East Kau—Hawaii.

KAPAPALA, KAU, HAWAII, Jan. 20, 1905.

I acknowledge receipt of your favor of the 16th inst., and in reply beg to say that nothing has been done by the Government in the way of a forest reserve in my division. I have waited patiently for a representative of the Government to visit my division, but so far no one has turned up. Aside from a commission, appointing me Forester, for a part of this District, have heard nothing more from the Bureau.

The forest reserve of the Hawaiian Agricultural Company containing some 40,000 to 50,000 acres, has been placed in my hands, and at present have full charge of it, the Hawaiian Agricultural Company paying all expenses in the way of repairs, etc., which amounts to quite an item in the course of a year. This reserve, as you know, is the largest of its kind on the Islands, and well deserves a visit from a professional forester, one who will give advice and tell us lots we don't know about a forest. Advice from a practical forester would be gladly taken by the Hawaiian Agricultural Company.

In connection with this reservation would say that at the present time it is next to impossible to penetrate it, for any distance. Young trees are coming up and showing a remarkable growth. All young trees look strong and healthy, but something must be done to put a stop to Japanese and others cutting down the young trees. Is there any law by which you can punish them?

Yours very truly,

J. MONSARRAT.

REPORT OF MR. GEORGE C. HEWITT.

West Kau—Hawaii.

Mr. George C. Hewitt, the Consulting Forester for West Kau, was prevented by duties in connection with the United States Circuit Court from making a regular report. Mr. He-

witt says in correspondence: "As near as I can learn the forest of Kau remains about as ever and no changes have taken place to notice."

REPORT OF MR. FRANZ BUCHHOLTZ.

South Kona—Hawaii.

HONOLULU, T. H., Dec. 22, 1904.

Your letter of the 3rd inst. came to hand and in answer to the several questions therein have this to say:

There exists in my district only virgin forest and to the best of my knowledge no new forest has been planted so far by anybody.

Forest nurseries do not exist unless you should feel inclined to call my clearings by that name. I have, as a matter of fact, cleared one acre lots at the following elevations: 2300 feet, 3200 feet, 4000 and 5000 feet. They have been also fenced and the whole affair cost between $5000 to $5500, but I have planted trees only on the lower lot, because the assistance which I expected from the Government did not come and it became too expensive for me to continue the experiment. My intention was to plant on each lot the same varieties of trees, in order to find out which ones would grow the best at the different elevations and on the different soils. I have planted the following varieties: Lebanon Cedar, Silk Oak, some Japanese Fir trees, with Oak, Camphor, Eucalyptus, Chinese Plum, African Locust, Ironwood and a number of fruit trees. The forest trees all do very well at an elevation of 2300 and at 1650 feet elecation, and I am of the opinion that some of them, particularly the Fir trees, would do better at the higher elevations.

The native forest is all in a vigorous condition, the dead or dying trees which one sees die because of old age, or as on the higher lands because there is not enough soil to permit them of growing any longer. Of insects which might have caused the death of trees, I have not noticed any this year, although there is no doubt in my mind that there exist some.

The forests of Hawaii are of the greatest importance to the welfare of the country and their proper management will benefit

the finances of this country enormously. I consider it a great mistake and a great waste the way the forests are attended to at present. The valuable woods which grow here, if properly handled, would give us an income of millions. Instead of creating forest reserves in which the trees are permitted to grow, die and rot, I should propose to cut the trees old enough for that purpose, sell them and plant new forests, which could be made as valuable and more so than the ones we have now, and give this country a continuous and large income for all time to come. I am also of the opinion that not *an acre of land* should be set aside for a forest reserve which could grow agricultural products, and only such lands planted and kept in forest of *which there are plenty,* which will grow nothing but forest.

FRANZ BUCHHOLTZ.

REPORT OF HON. J. D. PARIS.

Central Kona—Hawaii.

KEALAKEKUA, HAWAII, Jan. 16, 1905.

The condition of the forest in my section is as follows:

That section extending from Holualoa, North Kona, to Honalo, North Kona, a width of about four miles; there is a heavy forest principally of Koa and Ohia in good condition.

That portion extending from Honalo, North Kona, to Kahauloa in South Kona; the Koa and all the smaller trees, such as Pua, Kolea, Pilo and Opeko are fast disappearing, owing to the lands being stocked with cattle, the underbrush is cleared away, the old die out and the young trees are destroyed.

That section extending from Kahauloa to Honokua in South Kona; the forest is in fine condition. A portion of this includes the forest reserve fenced off by the Bishop Estate. The young Koa and other Hawaiian trees are growing up. This section is about six miles wide.

There has been no planting of foreign trees for forestry in the Konas. Although Blue Gum, Ironwood and some other foreign trees planted for ornamental purposes do well.

The forest has not suffered in my section from any blight, except on the Koa there is a worm which has been here for a

number of years and destroys the foliage. It is worse some years than others.

As a whole the forest in my section is in a healthy and thriving condition.

I remain,

J. D. PARIS.

REPORT OF MR. JOHN MAGUIRE.

North Kona—Hawaii.

HUEHUE, KAILUA, HAWAII, Dec. 14, 1904.

Owing to the porous nature of the soil of Kona there are no streams or springs, consequently Kona needs a great deal of forest vegetation to supply moisture to the country.

There is already a virgin forest around the base of Hualalai, which I think the Government should make every possible effort to preserve.

The forests of Kona consist of groves of beautiful Kukui, Koa and Ohia trees, all in their natural wildness, the Ieie forming a network in places impassable, even to cattle.

There are no planted forests in the district, a number of fruit trees, such as Mangoes, Alligator Pears and Oranges are often found growing wild along the roadside.

No foreign trees are planted for shade along the roads, the beautiful Kukui tree being found in abundance, an easy and natural shade tree. The Silk Oak (*Grevillea robusta*) does well in the open barren sections.

Even the Lantana is of use in covering the barren stretches of lava flows, and helps the supply of moisture to the country.

But to the ranchman it is a pest, as it covers up all the good pickings amongst the rocks. In April or May, 1903, some Lantana Blight was sent to me from the Agricultural Experiment Station of Honolulu. About a year after, I noticed brown spots among the Lantana, and within the past three months about 150 acres, more or less, of Lantana look apparently dead. I find the blight spreading rapidly, and at the rate it is working, the Lantana ought to be cleaned out around here in two or three years.

I notice the Mamani is springing up all over the slope of Hualalai, great stretches of barren country a few years ago are now solid forests almost impassable. The cattle do not seem to affect them. I hear it is the same on Mauna Kea and other places.

My theory is, that there must have been some insect that destroyed the old trees, and not the sheep and cattle, as these young forests of Mamani are not affected by the cattle that are now grazing in them. I have been told that years ago, during the reign of Kamehameha I. a fire swept the whole summit of Hualalai.

I have been asked twice to sell Koa bark for tanning, also Koa lumber. I do not believe in denuding forests; besides our forests are not extensive enough for any utilization of its products. The Koa seems to be naturally dying. Insects are rapidly destroying it as well as cattle, although I notice on knolls or places where cattle cannot get to, the trees are covered with insects and moss just the same.

Although I am a ranchman, I approve of forest preservation. My experience proves that it is absolutely necessary to have shade and moisture for cattle. All the Kona ranchmen know this and they reserve forest paddocks, which they use only during very dry weather, turning cattle out into makai lands whenever the rainy season begins.

The summit of Hualalai contains a number of extinct craters, and I doubt if they will ever be covered with vegetation, although the Mamani seems to be growing higher.

I advocate the preservation of forests along a line that will benefit the country below. In Kona the forest must be right in the line of settlement, and not on the tops of mountains as in other districts, for there is no watershed here. We must have moisture for water, and naturally we must have the forest as near to us as possible. Between 2,500 and 4,500 feet elevation is where the dense forest now is, and it will be an easy matter to preserve, although I think it will be hard to obtain the consent of private owners of land along that line, as in some parts of that location the best pasture lands lie, but Government lands which are there can easily be reserved.

J. A. MAGUIRE.

No reports were received from the other District Foresters.

ENTOMOLOGY.

REPORT OF R. C. L. PERKINS, ASSISTANT SUPERINTENDENT OF ENTOMOLOGY.

HONOLULU, OAHU, T. H., January 24, 1905.

TO THE HON. COMMISSIONERS OF THE
BOARD OF AGRICULTURE AND FORESTRY,
Honolulu, T. H.

GENTLEMEN:—Having myself just recently returned from a mission to Australia in company with Mr. Koebele, who still remains there, I am in his absence preparing a short account of the work carried out by him during the latter half of the year 1903 and the first few months of 1904, which time he chiefly spent in the States of Ohio and California. In May, 1903, Mr. Koebele, then Superintendent of Entomology under the Board, having completed his work on the insects attacking lantana in Mexico, and other matters, returned to Honolulu, but was granted leave of absence for two months by your honorable Board in order that he might more fully recover from the effects of the fever that he had contracted while working in the above-mentioned country.

On the expiration of this leave of absence, he had intended starting for Australia in search of natural enemies against the leaf-hopper of the sugar cane, and on July 14th, wrote to me to have all in readiness for him to go straight through to Sydney. About this time, however, he received information from the Department at Washington as to certain parasites of leaf-hoppers, which had been bred in Ohio by Mr. Otto Swezey and it was thought advisable to carry out some investigations in that locality.

Accordingly, Mr. Koebele proceeded to Columbus, Ohio, and continued his investigations in that State until October 10th, when the cold weather put an end to further entomological

work. During his stay in Ohio, work was entirely confined to the leaf-hopper question and about a dozen species of parasites on these (many of them quite new to science) were investigated, as well as certain predaceous insects likely to attack the cane pest of these islands. The living insects collected by Mr. Koebele were shipped at frequent intervals and handled at first by myself alone at the Government Nursery, but later on with the assistance of Messrs. Kirkaldy and Terry. Most of these consignments consisted of the cocoons of various species of ant-like parasites, resembling and allied to the Fairchild's parasite of the cane leaf-hopper, so well known to many sugar-growers. At the time when Mr. Koebele completed his work, I doubt whether more than a score or two of these insects had been bred in the United States, but to these islands I estimate the number of cocoons sent by him as not less than 3,000. From these, however, comparatively few mature insects were reared, because: (1) many were unable to stand the journey and died from some cause or other before arrival; and (2) many instead of producing the parasite, produced hyperparasites, which had destroyed the former.

In addition to these consignments of cocoons of parasites, which were despatched every two or three weeks, cages with living hoppers attacked by parasites were also sent.

On leaving Ohio, Mr. Koebele again visited and conferred with the entomologists at Washington, and returned to California to continue his researches on leaf-hopper parasites. From this State he continued to send consignments of cocoons and cages with living parasites, bringing the last lot with him on the "Sierra" of May 11th, when I joined him en route for Australia.

During the latter part of his stay in Alameda, in addition to leaf-hopper parasites, a few other beneficial insects (such as ladybirds for certain scale bugs) were also sent.

Of the twelve or more species of leaf-hopper parasites sent by Mr. Koebele, about four were bred in such numbers as to make their establishment here possible. One of these with winged female was bred in large numbers and distributed in various parts of Oahu and on Hawaii, in localities where the green Siphanta, sometimes called "torpedo-bug," was common. Whether this parasite has become established is not yet known.

The other three species of parasites all have wingless females, and were all experimented with as probable enemies of cane leaf-hopper. In confinement all three of these attacked the young leaf-hoppers, but the two species that were sent from Ohio did so less readily than the one from California. This was, I have no doubt, due to the fact that the California parasite was much more suited to this climate than those from Ohio, for while the former lived six weeks on an average in the breeding cages at the Government Nursery, the latter rarely survived a week's captivity. As a large number of the Californian parasite were liberated in the cane-fields and when liberated were seen to at once attack the young hoppers, it is reasonable to hope that this species at least will become firmly established.

It should be borne in mind that cases of rapid increase such as were exhibited by some of the lantana destroying insects, the Vedalia and Cryptolaemus ladybirds and others, are not normal, and, as I have elsewhere pointed out, it is usually two or three years before an imported insect becomes noticeably common.

Possibly, however, the greatest value of the work done by Mr. Koebele in Ohio and California lay in the mass of general information gained as to the various parasitic enemies of leaf-hoppers (a field, as I have shown above, very little investigated previously), and in the best mode of handling these parasites. Such information was of the greatest assistance when entering on the investigation of leaf-hopper enemies on the recent mission to Australia.

Finally, I am sure that Mr. Koebele would wish to express his obligations to all those who in any way assisted him in his researches, and especially to Dr. L. O. Howard and the entomologists of the Division of Entomology at Washington, to Prof. Herbert Osborn of the Ohio State University, and to Mr. Otto H. Swezey, who had previously investigated some of these parasites in Ohio. Also, as on previous occasions, we were specially indebted to Mr. Alexander Craw (now Superintendent of Entomology under your honorable Board) for taking proper charge of the insects, when they reached San Francisco and shipping them on to the islands.

Respectfully submitted,

R. C. L. PERKINS,

(Lately Assistant Superintendent of Entomology.)

REPORT OF G. W. KIRKALDY, ACTING SUPERINTENDENT OF ENTOMOLOGY.

HONOLULU, T. H., Aug. 12th, 1904.

THE HONORABLE BOARD OF COMMISSIONERS
OF AGRICULTURE AND FORESTRY,
Honolulu, T. H.

SIRS:—In the absence of Professors Koebele and Perkins, I herewith beg to present my report as Acting Superintendent of the Division of Entomology, for the term between May 18th, 1903, and August 12th, 1904.

Respectfully submitted,

G. W. KIRKALDY,
Acting Superintendent.

The reorganization of the Entomological Division was decided upon at the first meeting of the Board of Commissioners of Agriculture and Forestry on May 18th, 1903, and on the same date Mr. R. C. L. Perkins was appointed assistant to Prof. Koebele. Messrs. G. W. Kirkaldy and F. W. Terry were later engaged as assistants, the former entering upon his duties August 14th, the latter September 2nd.

Though for some time the Entomologists were most inadequately housed in the basement of the Capitol Building, this was remedied by their removal during February to the new quarters on King Street, at the Government Nursery. These are well equipped as regards laboratory apparatus, but a good working library is necessary, and till this is supplied, the work must be incomplete. The prime cost should be not less than $1500.00 with a yearly subscription of $200.00 for periodicals and recent literature.

On May 11th, Prof. Koebele returned from America and, with Prof. Perkins, sailed to Australia in quest of beneficial insects, particularly parasites of the leaf-hopper.

In August the Division was again reorganized, the Hawaiian Sugar Planters' Association forming a separate division for the entomological study of sugar cane and taking over in its entirety the Entomological Division of the Bureau, viz.: Professors Koebele, Perkins, Kirkaldy and Terry. During the absence of Professors Koebele and Perkins, I acted as Superintendent and therefore present the following brief report in that capacity, this report ending on August 12th, the date of Mr. Craw's arrival from San Francisco.

The most important duties of the staff related to inspection work, and particular attention was devoted to this. From August 26, 1903, to August 12th, 1904, 201 visits were paid to incoming vessels by one or more of the Entomologists; a considerable number of visits also was made to the Post-office. Especial attention was devoted to plants, as may be seen from detailed statements further on.

While housed at the Capitol, considerable time was taken up by travelling to and from the Nursery and by the attention given there to the parasites; this, with Inspection, care of the Library and office routine work, fully occupied the time of the Entomologists. At the Government Nursery, the saving of time in travelling was more than balanced by increased correspondence and inspection. In April I sustained a badly broken leg which has had to be reset twice and is not completely healed even at date of writing.

The fumigation work was attended to by Mr. C. J. Austin, who also assisted the Inspector at the wharves.

A considerable amount of time was also taken up by visitors applying for information about insect pests, particularly those attacking fruit trees and garden plants; this constituted a large part of the routine work of the office, and will in time take up almost the whole of one man's time.

After Inspection, the principal work lay in the details of attention to the insects of the sugar cane and lantana. The work on the former cannot at present be detailed satisfactorily and will in any case be carried on by the Hawaiian Sugar Planters' Association. Mr. Perkins' Bulletin on the subject ("The Leaf-Hopper of the Sugar Cane," Bull. 1, Div. Ent., Brd. Com. Agr. For., T. H., 1903, by R. C. L. Perkins) may be con-

sulted with profit. Work on the Lantana is discussed further on.

INSPECTION WORK.

(A) Plants and Roots.

CALIFORNIA—1327 consignments of plants and roots were introduced from the Coast of which 136 were passed at once, and 1180 were removed to the Government Nursery for fumigation, of which one large consignment consisted of 500 Banana suckers from Central America.

A case of Mangrove roots which were very badly infested with at least three distinct borers were destroyed; of these borers two have since been bred up, one a weevil, one a Bostrychid; neither of which has been identified with material in the Bureau Museum; the third (a Lepidopterous larva?) died.

One box of plants via the Nevadan in January was badly infested with Scales, Mealy bugs, *Gryllus sp., Tortrix sp.,* all new to this Territory; in February, the Sonoma brought one case containing 125 fruit trees which were very badly infested with (among other things) a very large nest of a species of the ant *Prenolepis, Myrmecophila* (a curious ant—loving Cricket), two species (Imago and larvae) of Carabidae (predaceous ground beetles), Tenebrionids, Acari (very abundant), Thysanura and Centipedes.

In March the Sierra brought a case of violets which contained one Lepidopterous pupa, an Aphid, several Coleoptera, Thysanura, Psocidae and Acari.

WASHINGTON—Seattle. Three cases of plants all passed.

CANADA—Vancouver. Three cases of plants all passed.

CUBA (via California)—A hundred cases of pineapple plants, which were infested slighly by a Mealy bug (*Trechocorys bromeliae*), and were fumigated.

ENGLAND (via Australia)—One case of bulbs passed.

JAPAN—Fourteen cases of plants, etc., of which two harbored borers and were destroyed.

CHINA—Ten cases of plants of which nine were fumigated; also five cases of sugar cane which were destroyed. As regards

the latter, Mr. Perkins wrote specially to the Board, under date of Feb. 11th, as follows:

"I beg to notify you that today I am destroying five large cases of sugar cane imported for eating purposes, the consignee being Foo Fang. This cane is infested with borer, not Hawaiian, also "leaf-hopper", one or more species, also in all probability not Hawaiian, since the cane was grown in China (not Australia whence came our leaf-hopper). Owing to the serious nature of the case, it will be necessary to keep the unpacking room in the new building, where these cases were opened, locked up for some days as an extra precaution. If the importation of this cane had not clearly been made in ignorance, it would be a positive outrage under the circumstances."

AUSTRALIA—Sydney. Four cases of plants of which three were fumigated, also a consignment of pineapple plants (badly attacked by a fungus, *Monilia sp.?*) which were burnt.

NEW ZEALAND—One case of plants passed.

SAMOA—Pago Pago. Seven consignments of vanilla cuttings and three consignments of cacao pods, passed.

VITI (or FIJI) ISLANDS—Forty bundles of vanilla cuttings passed.

GUAM—Three cycads and one fern passed, the former after being fumigated.

PHILIPPINE ISLANDS—Manila. Two orchids passed.

(B) Fruits, Vegetables, Etc.

CALIFORNIA—Forty-nine vessels brought general consignments of oranges, peaches, apples, cabbages, etc.*

Till comparatively recently, fruit and vegetables from the Coast were remarkably clean and free from pests. During the last two months, however, there has been a marked deterioration, in certain kinds. In June two very bad consignments of cabbages were brought by the "Alameda", the outer leaves being thickly infested with a cosmopolitan plant louse (*Aphis brassicae*). These were sent to the Government Nursery and the

* The total number of boxes of fruit thus imported was not computed by the Entomological Division.

outer leaves removed and burnt. Most of the cabbages were sold in this denuded condition, but some of the merchants declined to take delivery under these circumstances and apparently wrote to the Coast that the cabbages had been condemned altogether, as an angry letter was soon after received from a San Franciscan exporter.

On July 1st the same ship brought in three cases of limes from Acapulco, Mexico, and later on two more cases were brought; as this is the fountain of the Mexican fruit fly ravages, they were promptly burnt. Between that date and the present, 395 cases of peaches and apricots were refused admittance, being attacked by *Anarsia lineatella* (a Lepidopterous borer), which has not been recorded as occurring in the Territory, and is in any case a most undesirable reinforcement. Of these 395 cases, eight were consumed on board and 87 were destroyed at the Government burning grounds, while about 300 were reshipped to California.

A large proportion of apples was attacked by the Codling moth (*Carpocapsa pomonella*) and was destroyed; this moth, however, does not in any case appear to have been able to establish itself, probably owing to the unfavorable climate.

WASHINGTON—Seattle. Four consignments of fruits passed. Some of these consisted of apples which in a few cases were very slightly infested with the San Jose Scale (*Aspidiotus perniciosus*), but as this scale is quite innoxious here, no further steps were taken.

CHINA—Seven consignments of fruits from which ninety-three cases of pumelos and oranges were destroyed, being rotten and scaly; the rottenness was almost entirely due to gross carelessness or ignorance in packing. There were also numerous consignments of yams, ginger, and water-chestnuts.

JAPAN—Five consignments of oranges were passed.

AUSTRALIA—Sydney. One consignment of vegetables passed, also a consignment of pineapples and one of alligator pears, which were destroyed, being rotten. The pineapples were also attacked by a Mealy bug.

VITI ISLES—One case of yams passed.

FANNING ISLANDS—Six sacks of cocoanuts (*Cocos*) passed after being husked.

SAMOA—Three consignments of cocoanuts passed after being husked.

Besides these, the soils, etc., brought in by sundry vessels have been examined.

REGULATIONS FOR INSPECTION, ETC.

The Board has since passed a number of regulations for the prevention of importation of new insect pests. These I considered necessary for the reasons set forth in the following letters:

HONOLULU, T. H., June 1, 1904.

TO THE HONORABLE BOARD OF COMMISSIONERS
OF AGRICULTURE AND FORESTRY,
Honolulu, T. H.

GENTLEMEN:—I beg to recommend to the Honorable Board the advisability of prohibiting the importation, into this Territory, of any fruits from China, Japan, and indeed from any Eastern Pacific ports.

This is in view of the danger of introducing fruit flies.

My reasons are as follows:

1. The American and Canadian Inspectors are so firmly impressed with a sense of the danger that would result from the appearance in these countries of any fruit-flies, that special attention is paid to the latter and we would be at once advised of such appearance in the Daily and Weekly press, and could thus take steps to guard against the pest in the event of its establishment on the mainland.

2. There are, however, no agricultural Journals, to my knowledge, in China, Japan, etc. (except the Bulletin of the Agricultural College, in the University of Tokyo, which would scarcely deal sufficiently promptly with the matter) so that on the inevitable appearance in the near future, of any of the flies in those countries, we would be likely to have them established within Hawaii before hearing of their arrival in China or Japan.

It is true that the imports of fruits from these countries are small except at one season of the year, but last January-March

I had such considerable trouble with citrus fruits brought in for the Chinese seasonal festivities, that in my opinion these imports were of distinct menace to the fruit cultivation of Hawaii, inasmuch as a large proportion of the fruit was so rotten, owing to bad packing, that it was impossible to say whether they harbored fruit-fly maggots or not. A proportion of the remainder was infested by scales, which it is true are found here, but it is not desirable to reinforce them from outside.

As you are aware, I ordered the destruction by fire of a large proportion of the fruits, but, bearing in mind the danger incurred by the necessary two or three days' exposure on the wharves, it is inadvisable to risk a repetition of the past months' experience.

The adoption by your Honorable Board of this recommendation would entail the exclusion of all fruits, except from the United States and Canada, and apart from its advisability for the above reasons, might possibly lead to increased activity in the cultivation of the many admirable Citrus fruits now established here.

Yours respectfully,

G. W. KIRKALDY,
Acting Superintendent.

HONOLULU, T. H., July 1st, 1904.

W. M. GIFFARD, ESQ.,
CHAIRMAN, COMMITTEE OF ENTOMOLOGY,
BOARD OF AGRICULTURE AND FORESTRY,
HONOLULU, T. H.—

Dear Sir: I beg to refer the Honorable Board to my letter of June 1st and to urge upon them the importance of this matter, which admits of no delay in settlement.

In writing that letter I laid special stress upon the danger of unknowingly importing fruit-flies from the Orient, Australia, etc., and considered that there was little fear of these arriving via Canada or the United States. (I did not mention Mexico or South America, as I believe no vessels come into port direct from these countries.)

Since then, however, the matter has assumed a fresh aspect, consequent upon the fact that three boxes of limes have escaped the vigilance of the Californian Inspectors and arrived here by the "Alameda" to-day. These limes were imported from Mexico and are labeled "choice Acapulco," this place being the headquarters in Mexico of the dreaded "Mexican Orange fruit-fly" (*Trypeta ludens*).

Under these circumstances I would respectfully urge that a regulation be framed *immediately* forbidding the introduction into *any* Hawaiian ports, of fruits from *any* countries except the United States and Canada, and further, confirming the authority of the Entomologists to destroy *instantly* any fruits, even from these latter countries, that they regard as suspicious.

I would again urge upon the Honorable Board the *paramount* and immediate importance of this matter.

Very respectfully,

G. W. KIRKALDY,
Acting Superintendent.

INSECTS OF THE YEAR.

It is obvious that a residence of one year in these Islands is insufficient for either of the Assistant Entomologists to speak with any degree of authority upon questions into which climatic or other local conditions enter; consequently this first report is merely preliminary, many important investigations as yet incomplete being held over. Furthermore, the absence of a properly equipped library has hampered the work of the Entomologists and has prevented any systematic attempt at the determination of the collections except in a few instances. A few brief notes are simply made upon the principal insects of the year. A preliminary list of insects of economic importance was commenced in the "Hawaiian Forester and Agriculturist".

LANTANA.

A large amount of infected Lantana has been distributed to various inquirers, over the period, and is doing splendid work. The following selected letter is a specimen of the appreciation caused by the work of the lantana destroyers:

MAUI AGRICULTURAL CO., PAIA, MAUI, April 2, 1904.

"Dear Sir: I have been intending for some time to write to you on the good work performed here by the Lantana fly, which destroys the seed. As you may have heard it seems to be everywhere here, on Central Maui, where there is Lantana, and so numerous that a good seed can rarely be found. I understand that it is as numerous in Lahaina and Hana districts as it is here.

"Very truly yours,

"G. A. BALDWIN."

See Haw. For. Agr., vol. I, p. 11, Jan., 1904.

GUATEMALAN ANTS.

On April 20, 1904, the "Kelep," an ant which promises to be of great usefulness in checking the damage done to cotton by the Cotton Boll Weevil (*Anthonomus grandis*) in Texas and other States, was discovered on cotton in Guatemala.

On reading in a San Francisco paper that the ant had actually been introduced into Texas and had already "saved millions of dollars," I wrote to Dr. L. O. Howard, asking if the introduction was a fact, and if so, would he assist the Bureau in obtaining some individuals upon which to experiment, with a view to observing their behavior in relation to the leaf-hopper. Dr. Howard kindly responded at once, stating that the Coast Journals were misinformed, as the ant had not yet been introduced, and promising his assistance if opportunity offered.

LEPIDOPTERA.

1.—*Carpocapsa* (?) sp.

Seeds of *Acacia koa,* infested by this, were received for determination from the Superintendent of Forestry. It is impossible, however, in the absence of a library, to determine the species bred up.

See Koebele "Notes on Insects affecting the Koa trees at Haiku Forest on Maui," 1901) in Rep. Comm. Agr. Hawaii for 1900, pp. 64-65.

2.—*Cacoecia rosaceana* (Rose leaf-roller).

Reference, W. Saunders, 1900, "Insects Injurious to Fruits," pp. 90-1, text, figs. 89-91.

Specimens of the larvae were sent from Hawaii, with the quest for information as to whether they were Japanese beetles!

Cacoecia rosaceana is distributed, I believe, wherever roses, apples, etc., are grown. It feeds also in most stone-fruit trees, currants, gooseberries, strawberries, etc. The larvae are found coiled up in the smaller, tenderer leaves (these furnishing them with shelter and food), which they roll up in the form of hollow cylinders, firmly fastened with silken threads. When full grown they are about three-quarters of an inch long, usually pale greenish in color, with the head and part of the first segment brown, and a darker green stripe along the back, and a few smooth dots on each segment, from each of which there arises a short, fine hair.

"When mature the larva lines the inner surface of its dwelling place with a web of silk, and then changes to a chrysalis of a dark brown color. Toward the end of June, or early in July, with the help of some little thorns on the hinder segments, the chryalis wiggles itself half way out of the nest, and shortly after the imprisoned moth escapes.

"This is a short, flat moth, resembling a bell in outline when its wings are closed; but when expanded they appear arched on the front edge, curving in a contrary direction near the tip. The body is reddish brown, the fore wings of a light cinnamon-

brown color, crossed with little, wavy, darker brown lines, and with three broad, oblique, dark brown bands, one of which covers the base of the wings and is sometimes indistinct or wanting; the second crosses the middle of the wings; and the third, which is broad on the front edge and narrow behind, is near the outer hind margin. The hind wings are ochre-yellow, with the folded part next to the body blackish. When the wings are expanded the moth measures about an inch across."

The larva is attacked by certain parasitic Hymenoptera, but I do not know whether these are in Hawaii; none hatched out from the larvae sent.

Failing the parasites the best method of controlling this pest would be systematically to inspect the bushes and trees, especially in the cases of rose bushes, and to pinch the curled and twisted clusters of leaves, and incidentally the concealed larvae, taking care that the larvae do not drop out; spraying is of little use, owing to the great difficulty of reaching them.

3.—*Phlyctaenia despecta* (Butler).

Rhodaria despecta, Butler, 1877, Ent. Monthly Mag. XIV, p. 49.

Scopula exigua, Butler, 1880, ib. XVII, p. 9.

Scopula despecta, Meyrick, 1888, Trans. Ent. Soc. Lond., p. 217.

Phlyctaenia despecta, Meyrick, 1899, Fauna Haw. I, p. 217.

This is a common and well distributed moth, being found in all the larger islands.

Attempts were made to breed up the larvae, which greatly damage *Ipomoea bona-nox*, but in every case Hymenopterous parasites *(Limnerium hawaiiense)* resulted.

Blackburn described the larva in 1882 as follows: (Ent. Monthly Mag., XIX, p. 56.)

"Convex, broad in the middle and much narrower at the ends; each segment individually also narrowed behind and in front; green, almost unicolorous, save that the dorsal line is darker; a few long hairs on each segment. Feeds in folded leaves of a large convolvulus-like creeper, which grows plentifully on the banks of streams in mountain localities on the Hawaiian Islands."

DIPTERA.

"Horn-flies."

These flies have been very troublesome in certain districts and require thorough investigation, but this has not been done owing to the presence of the leaf-hopper problem. Two quite different flies are often confused under the name of "horn-fly"; these are *Stomoxys calcitrans* (the stable fly) and *Haematobia serrata* (the true horn-fly).

The horn-fly clusters in great numbers at the base of the horns of cattle, upon the udder, flanks, and, in fact, anywhere it cannot be easily reached by the animals. It is a blood sucker and its harmfulness lies in its enormous numbers and in the fact that it irritates the animals so that they cannot feed or digest properly, and so a free flow of milk is prevented, and their general condition is poor. As they attack both by night and day, the cattle get no rest.

The eggs are laid in fresh cow-dung and the maggots (larvae) are full grown before this is dry.

The stable-fly is also frequently mistaken for the true house-fly *(Musca domestica)*, which does not bite, but only irritates by everlasting walking over our skin for the purpose of sucking up perspiration, while the stable-fly bites fiercely, even sometimes through trousers and socks. The habits are very similar to those of the horn-flies.

(See also Rep. Minister Interior Hawaii for 1898, pp. 84-7, 1899.)

COLEOPTERA *(Beetles)*.

(1.) Much trouble has been reported as caused by various borers to alligator pear trees and many others, but in the absence of necessary literature these have not been properly determined, nor has there been any opportunity to make investigations on them.

(2.) Japanese Beetle. *(Adoretus umbrosus.)* Repeated applications have been made for beetles attacked by entomophthorous fungus, but owing to the long spell of hot, dry weather, we have not yet been able to establish this here.*

*This has since been well established.

HEMIPTERA.

(Bugs, Scales, Etc)

(1.) Various scales have been sent in for examination, but nothing new of special importance.

(2.) *Siphanta acuta.* (Walker.) Torpedo bug.

This green-winged, long-pointed leaf-hopper is very abundant on guava and other trees and has lately extended its ravages to coffee at Maunawili. It is destroyed by an entomophthorous fungus, which has also quite recently extended its beneficial ravages to the cane leaf-hopper at Kohala.

CITRUS CULTURE.

Although not strictly connected with my duties as Inspector, it became very evident to me soon after assuming those duties, that a not inconsiderable loss to the Territory resulted from the neglect of Citrus culture in the Islands and the consequent large importations from California. This impression was deepened by various letters received; I therefore wrote to the Board as follows:

July 1st, 1904.

THE HONORABLE BOARD OF COMMISSIONERS
OF AGRICULTURE AND FORESTRY,
HONOLULU, T. H.

SIRS:—I beg to call the attention of the Honorable Board to a matter which, although lying outside of my strict duties as an Entomologist, has nevertheless come to my knowledge therefrom; I allude to the cultivation, export, and import of Citrus fruits in and from the Hawaiian Islands.

It appears to me very desirable that a Bulletin should be prepared, setting forth the advantages of Citrus cultivation here, and giving full particulars for the use of intending cultivators should be provided.

I beg to suggest this because, although great quantities of these fruits are imported every week, it is also a fact that con-

siderable quantities are shipped, or are proposed to be shipped, to the Coast, a proceeding which appears to me uncommonly like introducing owls into Athens.

On the one hand there were 43 boxes of lemons and limes brought here by the "Alameda" to-day and I suppose that this means some 5000 to 7000 fruits; on the other hand, I received at the end of May a letter from a grower in Hawaii, asking for information re shipping these fruits to the Coast.

It seems indubitable that if it pays California growers to ship these here, it ought to pay a Hawaiian grower to dispose of his produce at home, better than to ship it to the Coast. In fact, I see no reason why any Coast growers at all should find it pay to send over Citrus fruits, as we ought to be able to produce all these here, better and more cheaply.

I trust the Honorable Board will accept this suggestion, although it is a matter that lies outside my regular duties.

Very respectfully,

G. W. KIRKALDY,
Acting Superintendent.

At the meeting held on August 3rd, 1904, the Board adopted the suggestion and requested Director J. G. Smith of the Federal Experiment Station to have a bulletin prepared, dealing with Citrus culture, which, I believe, will shortly appear.

BATS.

From time to time suggestions have been made on the introduction of various vertebrate animals into these islands for the purpose of preying upon noxious insects.

In May, 1904, Mr. L. G. Blackburn published in the official "Hawaiian Forester and Agriculturist" a recommendation as to the advisability of introducing bats for the above purpose.

Mr. Perkins was thoroughly satisfied that these insectivores would be unqualifiedly beneficial, but was skeptical as to the possibility of successful introduction. (See "Hawaiian Forester and Agriculturalist" for June, 1904, pp. 138-9.)

REPORT OF ALEXANDER CRAW, SUPERINTENDENT OF ENTOMOLOGY.

HONOLULU, T. H., December 31, 1904.

TO THE HONORABLE BOARD OF AGRICULTURE AND FORESTRY, HONOLULU, T. H.

GENTLEMEN:—I herewith present to you a brief report of work done in your Entomological Department since you placed me in charge of the same, August 12, 1904:

After reviewing the situation and past methods of controling importations along the waterfront, I was convinced that the Territory was not altogether safeguarded against the entry of injurious insects and plant diseases, owing to the location of the principal fumigatory being in the Government Experimental grounds, over a mile from the docks, and the cases and packages of imported trees and plants having to be hauled through a portion of the city, aligned with beautiful homes and grounds containing a great variety of ornamental and economic vegetation. When your attention was called to this danger you gave orders to have the necessary fumigating outfits built on the docks. Four were constructed in the most suitable locations, thereby saving the expense of hauling, as well as reducing the danger of introducing pests. The walls, ceilings, floors and doors are double, with heavy roofing paper between, to make them absolutely gas tight. The doors are wide, to admit the entrance of the largest cases for fumigation before being unpacked for inspection. Two of them are constructed so they can be used for the treatment of plants or seeds that require disinfection with the fumes of carbon bisulphide, instead of the usual fumigation with hydrocyanic acid gas. Root insects, such as borers, Phylloxera, seed and nut infesting weevils, are best treated with the former, as it is a very powerful solvent, destroying the inert pupa within the seed or nut, without injuring their germinating power. Both gases are extremely deadly if inhaled by man or any of the vertebrate animals, on that ac-

count we keep the materials and outfits under lock when in operation. In California quarantine work I used the hydrocyanic gas for the destruction of all noxious imported animals, such as the mongoose, fruit-eating bats, and other prohibited species. It is unquestionably the most expeditious method and resuscitation is impossible.

INSPECTION.

I retained the services of C. J. Austin as my assistant and we are present upon the arrival of all passenger ships. Mr. Austin personally boards all sailing vessels and looks over the ships' manifest, as well as makes inquiries from officers and crew if they have any plants or fruit. If any such are on board he telephones for me.

VALUABLE ASSISTANCE.

Under instructions of Collector of Customs E. R. Stackable, the customs officers, when searching the baggage of the passengers, kindly call our attention to any plants, or anything in our line they may find therein, and while a foreign vessel remains in port the guarding officer will not allow such things to be taken ashore unless first passed upon by an officer of your Board. This is a valuable service for the planters, fruit growers and agriculturists of the Territory, and cannot be estimated in dollars and cents, if we may judge by the experiences of the past few years with cane leaf-hoppers, etc.

IMPORTATIONS.

Since August 12, 1904, exactly one hundred steamers and sailing vessels entered the port of Honolulu from outside the Territory of Hawaii, and brought 54,721 packages of fruits, vegetables and plants, fruits mostly from California.

The principal port of entry for fruits, plants and trees is through Honolulu. But as considerable shipping is done through the ports of Hilo on Hawaii, and Kahului on Maui, I would advise the appointment by your Board of one paid Inspector at each port. Such appointments would be money well

spent in the interest of agriculture and forestry. At the beginning of my duties here numerous receipts of peaches and nectarines were found infected with larvae of *Anarsia lineatella*. In some instances the fruit was destroyed by burning, and others were allowed to be taken on board the steamer again and taken out of the Territory. Lemons and some other fruits have been treated in a similar manner.

Several importers were in the habit of purchasing low grade cheap apples and pears, and disposing of them to cheap restaurants and people at a great profit. This class of fruit is more likely to be infected with insects, and in addition it created the impression that anything would be permitted in the Honolulu markets. Such importers were given to understand that no such cull fruit would be admitted and the result has been the arrival of a better grade of fruit. It is almost impossible to exclude every codling moth worm, as the eggs may have developed after shipment. The codling moth is a very serious pest in apple and pear growing countries, but probably will not damage any of the products of these islands, as it has undoubtedly been imported here for years. Another pest of this character came in on the S. S. "Korea" on September 6th from the Orient, consisting of 10 boxes of sand pears infested with the "Chinese fruit moth worm" *(Laverna herellara)*. This pest is not known on the mainland of the United States, but unfortunately has been introduced into British Columbia. Fumigation has no effect upon a pest of this character, so the fruit and boxes were destroyed by burning. The small worms will enter at any part of the fruit, causing a brown, circular blotch, that soon thereafter decays; specimens have been preserved in dilute formalin.

FRUIT FLIES.

Fruit-flies are unquestionably the most destructive of all known pests. The melon fly *(Dacus cucurbitae)*, that was unfortunately introduced here a few years ago from Japan, is an example. That pest has practically stopped the production of muskmelons here. It also attacks other melons, besides cucumbers, squash, tomatoes and even string beans.

As other species of this destructive group of flies are known

in other portions of the world, that attack oranges, mangoes, bananas, and even young cocoanuts, you very wisely passed a new regulation (Gen. Circ. No. 2) prohibiting the importation of fresh fruits from certain quarters of the globe into the Territory of Hawaii, which was promptly signed by the Governor.

PLANT IMPORTATIONS.

Since my arrival plants have been received from England, various States of the Union, Ocean Island, Manila, Australia, Peru, and Japan. Scale insects, leaf eating larvae, twig borers, and microscopic leaf eating mites, new species to the Islands, were destroyed, and other plants infested with insects already established here, were thoroughly fumigated and passed. Samples have been preserved for the official collection.

A passenger arrived November 2nd, ex S. S. "Manchuria," having in his possession six small Manila hemp plants *(Musa textiles)*. As the plants were slightly infested with microscopic mites, a species of *Tetranychus,* I burned them. We already have that valuable fiber banana on the Islands and any injurious insect would possibly interfere with its profitable cultivation should it ever be undertaken on Hawaii.

From China we found two baskets of old "white nuts" *(Salisburia adiantifolia)* infested with moth and beetle larvae.

From Japan came three pine trees, the tips of which were infested with Lepidopterous twig borers. On another pine tree from the same country ex S. S. "Mongolia" we found armored scales, *Poliaspis pini,* upon the leaves. With the exception of specimens put up in glass tubes all the above were destroyed.

In two cases of plants from Japan we destroyed five double-flowering prune trees, two flowering cherry trees, infested with the very serious armored scale, *Aulacaspis pentagona.* This scale will withstand the strongest solutions of the best spray mixtures. It is a circular white scale and a very general feeder, infesting fruit trees, tea plants, and a variety of ornamental plants in Japan. Five Camellia plants had the "double scale" *(Aspidiotus duplex)*. This scale burrows slightly under the thin epidermis of the bark and like the "mining scale" *(Howardia biclavis)* it is difficult to detect, having the same

color as the bark. It attacks Orange trees, Azalias, Rhododendrons, Tea and even Camphor trees. Unlike the "mining scale" it succumbs readily to fumigation with hydrocyanic acid gas. But if it is not already found in the Territory we can get along better without, so burned them.

From California came six "Navel" orange trees, on which we found a few "black" and "hemispherical" scales, as we have both species, I fumigated and passed them.

On the S. S. "Doric" from Japan a passenger brought a box of Mammoth chestnuts, that we found to be infested with the larvae of a beetle. A number of the nuts contained from one to eleven larvae in a single nut. The box and contents were burned. Samples of nuts and insects were put up for office specimens. I am not aware that chestnuts are grown on any portion of the Islands, but such insects could possibly adapt themselves to other products.

BY MAIL.

Just before Christmas a package of cotton bolls arrived from Columbus, Georgia. One of the bolls had been burrowed into, evidently by a beetle, and possibly the cotton boll weevil. I, however, have no record of that pest having been found in Georgia, but as it is spreading so rapidly through the Southern States, it is well not to take the risk, as we have a little cotton growing in an experimental way in various portions of the Islands.

The Federal Agricultural Department is evidently looking out for the cotton industry, not only by appropriating a quarter of a million of dollars in an effort to check or stamp out the weevil pest in the South, but by making experiments with cotton in new sections. An instance of this kind is probably under way now, as the S. S. "Sierra," that arrived on December 29th, 1904, brought in six sacks of cotton seed from Florida, consisting of six varieties, fifty pounds of each, consigned to the Federal Experiment Station here. I took the precaution to treat the seed with carbon bi-sulphide fumes. A sample of the Georgia cotton bolls was mounted in a case and is on exhibition in the office.

We have another exhibit that came by mail, showing the danger of introducing pests upon even such small plants as can be transported in that manner. It consisted of eight small Ixora plants from a Philadelphia nursery firm. The leaves were infested with the "thread scale" *(Ischnaspis longirostris)*. This is a serious palm scale and unfortunately has been established on Oahu and probably was introduced in the same way. Only the leaves of the Ixora appeared to be infested, so were removed and plants thoroughly fumigated.

PROMISED FEDERAL AID.

As the imports of plants and fruits cannot be interfered with until proper entry has been made to the Collector of Customs, and as the docks are in close proximity to cultivated plants, I realized the danger of such freight remaining any length of time without treatment, so addressed the following letter to the Hon. James Wilson, Secretary of Agriculture, Washington, D. C.:

"DEAR SIR:—In order to better protect the Islands against further importation of destructive insect pests and diseases the Board has drafted regulations, under a Territorial Act, prohibiting fruit from countries where fruit-flies are known to exist. Those insects, as you are undoubtedly aware, are the most prolific and disgusting pests that fruit growers have to contend against. In Queensland, Western Australia, Cape Colony, and several other countries it is practically impossible to grow certain fruits. Tropical fruits, such as bananas, mangoes, and even young cocoanuts, in some sections, are not exempt.

Another serious danger to the agricultural and horticultural interests of the Territory is the delay sometimes caused by careless importers in not making prompt entry or application for delivery of such goods. This, of course, does not occur often, but the danger of certain insects developing and escaping from the cases during such delay is certainly very great. This could be avoided if the collector had the authority to grant us the privilege of treating the cases with the necessary amount of hydrocyanic acid gas. This is done after the plants have been passed by the Custom House authorities, so there can be no valid

objections to its more prompt application. The danger of introducing new pests would thus be reduced to a minimum.

"Your knowledge of the enormous danger and loss that has resulted to the horticultural and agricultural interests of the United States through imported insect pests and fungus diseases is the reason I appeal to your department, instead of directly to the Secretary of the Treasury, for the necessary authority to be granted the Collector of Customs of the Territory of Hawaii in the foregoing requests.

"Trusting we may have your valuable co-operation in our efforts to keep out further pests, I remain,

"Respectfully yours,

ALEXANDER CRAW,

"HONOLULU, T. H., Nov. 28, 1904."

The following reply has been received:

"DEPARTMENT OF AGRICULTURE,
"OFFICE OF THE SECRETARY.

"WASHINGTON, D. C., December 12, 1904.

"MR. ALEXANDER CRAW,
DEPARTMENT OF AGRICULTURE,
"HONOLULU, HAWAII.

"DEAR SIR:—I am in receipt of your letter of November 28th regarding steps to be taken to guard against the introduction of insect pests into Hawaii, and note your desire that authority be given the Collector of Customs at Honolulu to grant you the privilege of treating cases of plants with hydrocyanic acid gas.

"We will co-operate with you in the endeavor to obtain from the Treasury Department the desired authority.

"Respectfully,

"JAMES WILSON,
"Secretary."

The necessary authority has since been granted by the Treasury Department.

INTRODUCTION OF PARASITES AND BENEFICIAL INSECTS.

We certainly have more than our share of troublesome bugs and blights, which as far as I can determine are not indigenous to the Hawaiian Islands, but have been brought here upon imported plants without their natural checks. This has been the experience of other countries.

All artificial methods of stamping out, or even controlling, introduced insect pests have proved abortive and the only effective method is that pursued by your Board and the California Board of Horticulture, viz: to send experts to the country from whence came the injurious insect and collect the insects that keep it in check in its native home.

There is positively no risk involved in the introduction of an insect that lives entirely upon other insects, and you cannot any more change their diet than you could that of a tiger to that of a ruminant. So much effective work has been done in this line that it is beyond the experimental stage. However, we must have the true enemy. I have in mind an instance in California where two scales were introduced years ago, one from Australia and the other from Japan. They were both pronounced identical by the foremost scale experts, as no structural difference could be detected, even with the microscope, but a difference in habit was noticeable. The difference that escaped the eyes of man, assisted by the strongest microscopes, does not escape the eyes of a small four-winged parasitic fly—hardly noticeable to the unaided eye—for it would select the one and not the other scale. This shows the importance of having trained and observant men conduct such work, which has raised the value of entomology in aiding the horticulturist and agriculturist in fighting their insect pests.

Too much praise cannot be given such men as Koebele, Compere and Perkins for their valuable research in this line; a work, the character of which takes them to all portions of the world and into climates that are not conducive to health and happiness. Do you wonder that such occupation is not more generally sought after by men trained in entomology?

Some people persist in saying that the only instance where the introduction of beneficial insects has been successful was in

the case of the *Vedalia cardinalis* against the cottony cushion scale. This is not so, for I can refer to at least a score of insects that were formerly very destructive pests and are to-day of no importance, simply because of having been controlled by their natural enemies.

LEAF HOPPER PARASITES.

I am pleased to chronicle what, in my opinion, will prove to be another ocular demonstration of the value of this work to tillers of the soil.

Less than one year ago you dispatched Messrs. Koebele and Perkins in search of enemies of the destructive cane leaf-hopper *(Perkinsiella saccharicida,* Kirkaldy). The experts went direct to Australia, where it was supposed the leaf-hopper was introduced from on some cane. Several importations of insects came to hand, but it was early in October before what Koebele and Perkins considered the true enemy of the hopper, reached this station, and a few were bred out by the entomologists of the Hawaiian Sugar Planters' Association, when associated in this division. A colony of nine adult parasites, just discernible to the naked eye, were liberated in a cane plantation, where the leaf-hoppers were very numerous, by Mr. F. W. Terry and myself. A few days later nine more issued and as Mr. Terry could not leave I took them to the same plantation and placed them with the others. More parasites issued from subsequent importations and we took them to another field. On December 28th Mr. Terry and I visited both places and I am happy to report to you that we found the parasites established in both locations.

As cane matters are now under the management of the H. S. P. Association at their new quarters, all applications for this parasite will have to go through that station.

OTHER PARASITES.

Coffee and several other trees are subject to the attack of bugs of the same order as the cane leaf-hopper, but while not as destructive, they nevertheless do considerable damage, more especially to coffee. It is known as the "torpedo bug" *(Si-*

phanta acuta). One of the species of parasites to check the "torpedo bug" is a very minute four-wing fly, that deposits a single egg in the egg of the pest. These were liberated by us in a coffee plantation, but we have not yet had an opportunity to investigate the result.

Two other species of a larger fly that is parasitic upon Siphanta nymphs were received from Koebele and Perkins on December 14th. The first issued on Sunday, December 18th, and were liberated in a coffee plantation by Mr. Kotinsky and me, as we were anxious to give them every opportunity to establish themselves. When we reached the plantation we captured several Siphanta nymphs in a glass tube and it was a most interesting sight to behold how promptly the parasites attacked them, at the same time inserting their ovipositors. The captured "torpedo bugs" and parasites were then liberated. Since then more have been sent out. Mr. W. M. Giffard stated that the manager of the plantation reported to him numbers of young bugs, apparently in a healthy state, but motionless, attached to the leaves. This is characteristic of other similar insects when attacked by internal parasites. The manager understands the life history of the "torpedo bug," so would not be confused by their molted larval skins. This matter will be carefully looked into and if the parasites are breeding they will be sent wherever the "torpedo bugs" are found on the Islands.

HORN-FLY ENEMIES.

Several lots of "horn-fly" enemies have been received from Koebele and Perkins, but only 15 reached us alive, in rather an enfeebled condition after their long voyage. Mr. Koebele writes me that he will now be able to devote more time to enemies of this pest, as the weather has been too dry for insects of that class.

SCALE AND APHIS ENEMIES.

Various enemies of scale insects, aphis and other pests, have been received from your collectors and are being carefully bred by Mr. Kotinsky, whose report thereon accompanies this report.

The value and importance to the farmers of Hawaii in saving their crops from destruction by pests, and their bank accounts by the expenditure of their money in a fruitless effort to destroy the pests, convinces me that the Legislature will see that ample funds are appropriated for you to continue the important work of searching for and introducing beneficial insects.

Respectfully submitted,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

REPORT OF JACOB KOTINSKY, ASSISTANT ENTOMOLOGIST.

HONOLULU, T. H., December 31st, 1904.

MR. ALEXANDER CRAW,
Superintendent of Entomology and Inspector,
Honolulu.

SIR:—I have the honor to submit herewith my report for the period of my connection with this office, Sept. 14-Dec. 31, 1904.

I left Washington, D. C., on Sept. 14th, 1904, arriving at Honolulu Sept. 26. While the planters' entomologists were still in this office I took the opportunity to familiarize myself with the nature of the work before me, meantime assisting in the breeding of beneficial insects sent from Australia by Messrs. Koebele and Perkins. Beginning with Oct. 19th, when the second consignment, during my time, arrived, I was installed by you in the breeding room to take charge of the breeding work, which still remains in my care. Gradually it became evident that most of your time and that of the inspector's assistant must be devoted to the important work of inspection. Thus a good deal of the office routine devolves upon me. This includes such as laboratory work, care of collections and apparatus, etc.

WORK WITH LIVING INSECTS.

The tables appended below will give an approximate idea of the work done with living insects in this office. These do not include, however, the breeding, rearing, study, and observations on injurious insects that were done in the very short period of our tenure of office. Many valuable notes upon life histories and habits of beneficial insects were taken. These will prove useful at some future date, when they are completed, in the publication of bulletins or circulars. As the life cycle of some species extends over a period of years, and as not all the data could be secured during one cycle, it becomes evident that in these instances a number of years must elapse before all the data

will be ready for publication. Fortunately, however, this is not true of many insects in Hawaii, so that complete data upon the most common economic insect fauna will be shortly forthcoming.

INTRODUCTION AND DISTRIBUTION OF BENEFICIAL INSECTS.

In looking over the table of introductions (pp. 153-155) it will be observed that, in all, 19 species, comprising 500 specimens, most of which are new to the Islands, were introduced since June 22. As a general rule an average of 25% of all sent came alive, the rest having died en route. Considering that the insects for shipment must be collected within as short a time as possible before placing them in cold storage for the long voyage and that these were in most cases only to be found at a railway journey of one or more days from the starting point of the steamer, this may be regarded as a good percentage.

The table of distributions (pp. 156-159) offers even more interesting data. In all 82 colonies were distributed: 18 in October, 24 in November, and 40 in December. Most of the inoculated Japanese beetles were called for in October, as these insects were most troublesome in that month. The effects of the fungus in destroying the beetles became manifest with the advent of rains, and now they are scarce.

This climate is most admirably adapted for the propagation of plant lice, neither is a variety of species of these insects wanting upon these islands, yet, people are scarcely aware of their existence. Any one at all familiar with insect life detects them upon young shoots of orange, etc., though ever accompanied by a strong colony of lady birds in all stages, which soon checks the ravages of the plant lice.

APPARATUS.

When the Planters' Entomologists vacated it became evident that apparatus facilities were lacking for effective work. These are being obtained.

LIBRARY.

What was said of apparatus was equally applicable to library facilities at the time of the separation of Territory and Planters'

entomologists. A working entomological library is the entomologist's right hand in his daily work. A list of books absolutely necessary was immediately made up, and they are being procured.

CATALOGUES.

Library—To possess a library is one thing, to have this library available is another. Every agricultural experiment station in the world is a source of valuable entomological contributions. In order to be able to lay one's hands on desired information upon a certain insect a card index is inevitable. This is especially true of the entomologist's reports of this country since their appearance here. Numerous insects have been introduced into these islands intentionally and otherwise. Many of these have been recorded in the series of reports, yet, unless one has actually observed them, he cannot be sure that they are here at a moment's notice.

As neither you nor I had the time to devote to this necessary work, a clerk was temporarily engaged for this work. Meantime, as Miss Melika Peterson, the clerk for the Board, was constantly kept busy by the Forestry and Board work, this clerk, Miss C. A. Potter, was employed also in writing and indexing the correspondence of this office.

Introductions—Beginning with the first consignment of the last series Messrs. Kirkaldy and Terry, our predecessors in office, have begun recording the introductions of beneficial insects. This is being continued, and the following additional catalogues were inaugurated.

Distribution of Beneficial Insects—So far as possible it is advisable to keep records of localities where colonies of beneficial insects were placed in order to avoid duplication of work. The writer deems it advisable to supplement the distribution of beneficial insects by a system of education by means of well illustrated bulletins and circulars. Gradually, as the readers become familiar with the contents and subjects of these publications the work of distribution of well established species by the entomologists of this office will become diminished and they will be able to turn their attention into other useful channels.

Identifications—The insects brought by seekers of information are usually injurious and a knowledge of the distribution of

this class of insects over these islands is of vital importance. Hence the catalogue of identifications that has been started. In a way this will show the nature of work that has to be done by this office. An exact determination of the species is essential and this occasionally consumes a great deal of time.

Card System—This system was adopted in all the above mentioned catalogues, as it is most readily referred to and places desired information at its seeker's finger ends. Scientists are learning to adapt business methods just as business men are learning the advantages of utilizing scientific experience.

COLLECTIONS.

A well named and properly arranged collection of insects is one of the essential elements in an entomological office. Unfortunately the collection at the immediate disposal of this office is lamentably poor. With the object in view of building up such a collection, all insects reaching this office, except the live importations, were saved and whenever time permitted, pinned and labeled. Unfortunately, between the work of breeding, office work, and giving information to callers at the office, time was so well consumed that only rarely was I granted the treat of doing museum work. However, there is a good deal of material on hand, and it gradually will be mounted up for comparison and exhibition purposes.

DIVISION PUBLICATIONS.

Following is a list with brief resumes of Bulletins, Circulars and Articles in the Hawaiian Forester, published by the entomologists:

"The Leaf-Hopper of the Sugar Cane,"

by R. C. L. Perkins.

Bull. 1, Div. Entom., Brd. Comm. Agr. For., T. H., 1903.
pp. 38, oct., Honolulu, T. H.

This bulletin gives the history of this insect on these islands, traces its probable native home, and renders an account of its life history and habits, its effects upon the various varieties of cane,

and under variations of treatment of cane. Pages 16-26 are devoted to the leaf-hopper enemies occurring in sugar cane fields, and pp. 26-28 to other insect pests occurring in these fields, concluding with suggestions on means of checking the damage inflicted by the hopper. The Appendix on p. 31 is subdivided into four notes as follows:

NOTE I. Relative Resistance of Leaf-Hopper Eggs to Hydrocyanic Acid Gas, Corrosive Sublimate and Carbolic Acid." (Results of experiments performed by Mr. C. F. Eckart, Director of the H. S. P. A. Experiment Station.)

These were directed against leaf-hopper eggs in seed cane, and corrosive sublimate was found the most effective without injury to the seed.

NOTE II. (pp. 35-36.) "Varieties of Cane."

Seventeen of these are arranged by Mr. Eckart in the order of their powers of resistance to leaf-hopper injury. "Queensland 4" heads the list, and "Yellow Caledonia" concludes it, being the most resistant.

NOTE III is a technical description of a native 4-winged fly (*Ecthrodelphax fairchildii* Perk.), found parasitic upon the sugar cane leaf-hopper.

NOTE IV is likewise technical, consisting of a brief description of the cane leaf-hopper (*Perkinsiilla saccharicida* Kirk.), and a table for the identification of all but one of the known cane leaf-hoppers.

"Later Notes on Lantana Insects"

by R. C. L. Perkins.

Haw. For. Agr., vol. I, pp. 11-13, Jan., 1904.

The author discusses the effectiveness of these insects, by orders, upon the lantana, and the advisability of destroying it.

"On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane."

R. C. L. Perkins, Press Bull. of the Div. of Entom., Brd. Com. Agr. For., T. H., Apr. 7, 1904.

The author describes the "cane spume," discusses the amount of damage it causes, and the other forms of it present on the Islands and remedies. Brief technical descriptions of the ap-

pearance of the latter are given. A "Preliminary notice of another cane disease" is also here given.

"A Preliminary List of the Insects of Economic Importance Recorded from the Hawaiian Islands," by G. W. Kirkaldy.

Haw. For. Agr., vol. I (1904): June, pp. 152-159; July, pp. 183-189; August, pp. 205-210.—Continued., by Mr. F. W. Terry, l. c., Oct., pp. 273-275; Nov., pp. 299-302, and Dec., pp. 349-352.

With brief remarks here and there on their injuriousness, enemies, etc., the author in this series of articles enumerates the common injurious insects on these Islands. Completed and edited this material will make a useful bulletin, which should be published.

"Instructions to Guide Plantation Managers in the Collection, Transportation and Distribution of the Leaf-Hopper Parasite."

Anomalous, Haw. For. Agr., vol. I, pp. 13-14, Jan., 1904.

"How to Liberate and Distribute 'Leaf Hopper' Parasites." Anomalous, Haw. For. Agr., vol. I, pp. 114-115, May, 1904.

"Digest of the Statutes Relating to the Importations of Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." Gen. Circ. 1, Brd. Com. Agr. For., T. H., 6 pp., oct.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Fruits and Animals into the Territory of Hawaii." Gen. Circ. 2, Brd. Com. Agr. For., T. H., Honolulu, 1904. Approved Oct. 25, 1904.—3 pp., oct.

Respectfully yours,

JACOB KOTINSKY,
Asst. Entomologist.

LIST OF BENEFICIAL INSECTS COLLECTED FOR THE BOARD OF AGRICULTURE AND FORESTRY BY MESSRS. KOEBELE AND PERKINS IN THE AUSTRALIAN COLONIES, AND INTRODUCED INTO HAWAII, June 21—Dec. 31, 1904.

COLEPTERA (Beetles, Ladybirds)

Name	No. Rec'd alive	Date 1904	Steamer	Feeds on	Notes
Verania frenata	100	June 29	Aorangi	Aphis	Released on sugar cane plantation
Verania frenata	50	Oct. 19	Miowera	Aphis	Released on sugar cane plantation
Verania frenata	4	Nov. 17	Moana	Aphis	Retained for breeding in laboratory
Verania frenata	20	Dec. 6	Ventura	Aphis	Released in Honolulu
COCCINELLIDAE—					
Miscellaneous	?	June 21	Sierra	Aphis and Coccids	Released in Honolulu
Miscellaneous	14	Dec. 14	Aorangi	Coccids	Retained for breeding in laboratory
Miscellaneous	13	Dec. 27	Aorangi	Aphis and Coccids	Released in Honolulu
Miscellaneous (tiny, shining black)	40	Dec. 6	Ventura	Coccids	Retained for breeding in laboratory
Miscellaneous (black, red spot on each wing cover)	25	Nov. 17	Moana	Aphis	Retained for breeding in laboratory
Miscellaneous (black, red spot on each wing cover)	20	Dec. 6	Ventura	Aphis	Released in Honolulu
Miscellaneous (black, red spot on each wing cover)	13	Dec. 14	Aorangi	Aphis	Retained for breeding in laboratory
Miscellaneous (small, dark, brownish)	18	Nov. 17	Moana	Coccidae	Retained for breeding in laboratory
Miscellaneous (small, dark, brownish)	20	Dec. 6	Ventura	Coccidae	Released in Honolulu
Coelophora pupillata	1	Dec. 14	Aorangi	Aphis	Released in Honolulu
Cryptolaemus montrouzieri	3	Oct. 19	Miowera	Mealy bugs	Placed in breeding jar for this species
Cryptolaemus montrouzieri	1	Dec. 14	Aorangi	Mealy bugs	Released
Dung beetles	20	Oct. 19	Miowera	Maggots in dung	Released on a cattle ranch near Honolulu
Leis conformis	12	June 29	Aorangi	Aphis	
Leis conformis	31	Oct. 19	Miowera	Aphis	Released some on sugar plantation

LIST OF BENEFICIAL INSECTS COLLECTED FOR THE BOARD OF AGRICULTURE AND FORESTRY BY MESSRS. KOEBELE AND PERKINS IN THE AUSTRALIAN COLONIES, AND INTRODUCED INTO HAWAII, June 21—Dec. 31, 1904.—(Continued).

COLEPTERA (Beetles, Ladybirds)

Name	No. Rec'd alive	Date 1904	Steamer	Feeds on	Notes
Leis conformis	10	Nov. 17	Moana	Aphis	Oahu in Honolulu; sent to Hawaii, etc.
Leis conformis	40	Dec. 6	Ventura	Aphis	Some are still under observation in the laboratory.
Leis conformis	31	Dec. 14	Aorangi	Aphis	
Leis conformis	65	Dec. 27	Sierra	Aphis	
Neda testudinaria	2	Dec. 6	Ventura	Cane hopper	Referred to H. S. P. A. entomologists. They report having obtained eggs from these.
Orcus bilunulatus	2	Oct. 19	Miowera	Lecanium (?)	Retained for breeding in laboratory
Orcus bilunulatus	2	Nov. 17	Moana	Lecanium (?)	Retained for breeding in laboratory
Orcus cyanocephalus	a few	Aug. 22	Sierra	Aphis	Retained for breeding in laboratory
Orcus cyanocephalus	not given	Sept. 13	Sonoma	Aphis	Released on sugar cane plantation
Orcus cyanocephalus	a few	Sept. 21	Aorangi	Aphis	Released on sugar cane plantation
Orcus cyanocephalus	not given	Oct. 4	Ventura	Aphis	Released on sugar cane plantation
Orcus lafertei	3	Dec. 6	Ventura	D. nipae (?)	These were immature and died subsequently.
Orcus lafertei	3	Dec. 14	Aorangi	D. nipae (?)	Retained for breeding in laboratory
Orcus lafertei	1	Dec. 27	Sierra	D. nipae (?)	Retained for breeding in labortory
Platyomus Koebelei	17	Nov. 17	Moana	Coccidae	Retained for breeding in laboratory
Platyomus Koebelei	18	Dec. 6	Ventura	Coccidae	Retained for breeding in laboratory
Platyomus Koebelei	19	Dec. 14	Aorangi	Coccidae	Retained for breeding in laboratory
Platyomus Koebelei	1	Dec. 27	Sierra	Coccidae	Retained for breeding in labortory
Platyomus lividigaster	2	Dec. 14	Aorangi	Aphis	Released
Scymnids (tiny, shining; and black with 2 red spots)	140	Oct. 19	Miowera	Coccidae(?)	Some released, others retained in laboratory

LIST OF BENEFICIAL INSECTS COLLECTED FOR THE BOARD OF AGRICULTURE AND FORESTRY BY MESSRS. KOEBELE AND PERKINS IN THE AUSTRALIAN COLONIES, AND INTRODUCED INTO HAWAII, June 21—Dec. 31, 1904.—(Continued).

HYMENOPTERA (Internal Parasites)

Name	No. Rec'd alive	Date 1904	Steamer	Feeds on	Notes
Chalcid		Oct. 19	Miowera	Mealy bugs	Several reared and released on alligator pear scale in Honolulu
Chalcid		Oct. 19	Miowera	Siphanta eggs	Over 100 reared and distributed on Oahu
Dryinus (roundish pupa)	19	Dec. 14	Aorangi	Siphanta nymphs	All those reared released on coffee plantation on Oahu
Dryinus (elongate pupa)	5	Dec. 14			

NEUROPTERA (Lace wing flies)

Name	No. Rec'd alive	Date 1904	Steamer	Feeds on	Notes
Chrysopa	2 bred	Dec. 14	Aorangi	Scale, aphis, etc.	2 bred out and released on scale infested alligator pear trees in Honolulu

LEPIDOPTERA (Moths)

Name	No. Rec'd alive	Date 1904	Steamer	Feeds on	Notes
Thalpochares sp.		Oct. 19	Miowera	Presumably scale	A number of males and females bred and released on scale infested alligator pear trees in Honolulu
Thalpochares sp.	some 10 bred	Nov. 16	Moana	Presumably scale	

COLONIES OF INSECTS AND FUNGUS DISTRIBUTED FOR THE BOARD OF AGRICULTURE AND FORESTRY BY THE DIVISION OF ENTOMOLOGY DURING THE THREE MONTHS, OCTOBER-DECEMBER, 1904.

COLEOPTERA (Beetles, Ladybirds)

Name	Number	Date 1904	Feeds upon	Locality
Verania frenata	50	Oct. 25	Aphis	Sugar Cane, Waipahu, Oahu
Verania frenata	9	Oct. 25	Aphis	Honolulu, Oahu
Chilocorus circumdatus	12	Nov. 20	Armored scales	Waialua, Oahu
Chilocorus circumdatus	12	Dec. 13	Armored scales	Olaa, Hawaii
Chilocorus circumdatus	27	Dec. 27	Armored scales	Olaa, Hawaii
Coccinella repanda	13	Nov. 20	Aphis	Waialua, Oahu
Coccinella repanda	5	Dec. 12	Aphis	Honolulu, Oahu
Coccinellidae (mixed)	15	Dec. 31	Mealy bugs	Honolulu, Oahu
Coelophora pupillata	4	Dec. 13	Aphis	Olaa, Hawaii
Cryptolaemus montrouzieri	36	Nov. 3	Mealy bugs	Wahiawa, Oahu
Cryptolaemus montrouzieri	12	Nov. 3	Mealy bugs	Kapiolani Park, Honolulu
Cryptolaemus montrouzieri	25	Nov. 4	Mealy bugs	Tantalus, Oahu
Cryptolaemus montrouzieri	25	Nov. 20	Mealy bugs	Waialua, Oahu
Cryptolaemus montrouzieri	25	Nov. 20	Mealy bugs	Sisal, Oahu
Cryptolaemus montrouzieri	25	Nov. 22	Mealy bugs	Kohala, Hawaii
Cryptolaemus montrouzieri	40	Dec. 1	Mealy bugs	Wahiawa, Oahu
Cryptolaemus montrouzieri	8	Dec. 12	Mealy bugs	Honolulu, Oahu
Cryptolaemus montrouzieri	12	Dec. 13	Mealy bugs	Waikiki, Oahu
Cryptolaemus montrouzieri	2	Dec. 23	Mealy bugs	Kaimuki, Oahu
Dung beetles	20	Oct. 20	Horn fly and other maggots	Waialae, Oahu
Leis conformis	25	Oct. 25	Aphis	Waipahu, Oahu
Leis conformis	7	Oct. 27	Aphis	Honolulu, Oahu
Leis conformis	6	Nov. 20	Aphis	Waialua, Oahu
Leis conformis	100	Nov. 22	Aphis	Kohala, Hawaii
Leis conformis	35	Nov. 22	Aphis	Waipahu, Oahu
Leis conformis	2	Nov. 28	Aphis	Honolulu, Oahu

COLONIES OF INSECTS AND FUNGUS DISTRIBUTED FOR THE BOARD OF AGRICULTURE AND FORESTRY BY THE DIVISION OF ENTOMOLOGY DURING THE THREE MONTHS, OCTOBER-DECEMBER, 1904.—(Continued).

COLEOPTERA (Beetles, Ladybirds)

Name	Number	Date 1904	Feeds upon	Locality
Leis conformis	13	Dec. 10	Aphis	Honolulu, Oahu
Leis conformis	24	Dec. 12	Aphis	Honolulu, Oahu
Leis conformis	12	Dec. 27	Aphis	Honolulu, Oahu
Leis conformis	12	Dec. 28	Aphis	Waipahu, Oahu
Leis conformis	12	Dec. 29	Aphis	Makaweli, Kauai
Leis conformis	12	Dec. 29	Aphis	Eleele, Kauai
Leis conformis	12	Dec. 29	Aphis	Honolulu, Oahu
Orcus chalybeus	1	Dec. 13	Aphis	Honolulu, Oahu
Platyomus lividigaster	25	Nov. 20	Aphis	Waialua, Oahu
Platyomus lividigaster	2	Dec. 12	Aphis	Honolulu, Oahu
Rhizobius (?) mixed	12	Nov. 22	Aphis and scale	Kohala, Hawaii
Rhizobius ventralis	40	Dec. 13	Scale insects	Olaa, Hawaii
Rhizobius ventralis	7	Dec. 13	Scale insects	Waikiki, Oahu
Rhizobius ventralis	6	Dec. 23	Scale insects	Kaimuki, Oahu
Scymnidae, mixed	25	Oct. 20	Scale insects	Honolulu, Oahu
Scymnus vividus	12	Dec. 1	Scale insects	Wahiawa, Oahu
Scymnus vividus	30	Dec. 13	Scale insects	Olaa, Hawaii
Scymnus (?) (brownish)	25	Dec. 27	Scale insects	Honolulu, Oahu
Scymnus (?) (tiny, black)	25	Dec. 27	Scale insects	Honolulu, Oahu
Vedalia cardinalis	25	Nov. 2	Cottony cushion scale	Moanalua, Oahu
Vedalia cardinalis	25	Nov. 4	Cottony cushion scale	Tantalus, Oahu
Vedalia cardinalis	20	Nov. 22	Cottony cushion scale	Kukuihaele, Hawaii
Vedalia cardinalis	9	Dec. 12	Cottony cushion scale	Honolulu, Oahu
Vedalia cardinalis	12	Dec. 13	Cottony cushion scale	Kahuku, Oahu
Vedalia cardinalis	10	Dec. 13	Cottony cushion scale	Honolulu, Oahu
Vedalia cardinalis	7	Dec. 22	Cottony cushion scale	Honolulu, Oahu
Vedalia cardinalis	12	Dec. 31	Cottony cushion scale	Waimanalo, Oahu

COLONIES OF INSECTS AND FUNGUS DISTRIBUTED FOR THE BOARD OF AGRICULTURE AND FORESTRY BY THE DIVISION OF ENTOMOLOGY DURING THE THREE MONTHS, OCTOBER-DECEMBER, 1904.—(Continued).

HYMENOPTERA (Internal Parasites)

Name	Number	Date 1904	Feeds upon	Locality
Chalcidae	2	Oct. 20	Par. on mealy bug..	Honolulu, Oahu
Chalcidae	1	Oct. 27	Par. on mealy bug..	Honolulu, Oahu
Chalcidae (?)	24	Oct. 21	Siphanta eggs	Nuuanu Valley, Oahu
Chalcidae	36	Oct. 22	Siphanta eggs	Nuuanu Valley, Oahu
Chalcidae	30	Oct. 27	Siphanta eggs	Nuuanu Valley, Oahu
Chalcidae	6	Oct. 30	Siphanta eggs	Nuuanu Valley, Oahu
Chalcidae	17	Nov. 1	Siphanta eggs	Nuuanu Valley, Oahu
Dryinus (roundish pupae)	2	Dec. 19	Siphanta nymphs . . .	Waimanalo, Oahu
Dryinus (roundish pupae)	11	Dec. 21	Siphanta nymphs . . .	Waimanalo, Oahu
Dryinus (roundish pupae)	3	Dec. 22	Siphanta nymphs . . .	Waimanalo, Oahu
Dryinus (roundish pupae)	5	Dec. 24	Siphanta nymphs . . .	Waimanalo, Oahu
Dryinus (elongate pupae)	3	Dec. 31	Siphanta nymphs . . .	Waimanalo, Oahu

LEPIDOPTERA (Months)

Thalpochares sp.	4	Nov. 7	Scale insects	Honolulu, Oahu
Thalpochares sp.	4	Nov. 9	Scale insects	Honolulu, Oahu
Lantana leaf-miners	hundreds	Dec. 29	Lantana leaves	Eleele, Kauai

NEUROPTERA (Lace-wing flies)

Chrysopa (?) sp.	2	Dec. 23	Scale insects, etc. . . .	Honolulu, Oahu

HEMIPTERA (Bugs)

Tingid	200	Dec. 29	Lantana leaf	Eleele, Kauai

COLONIES OF INSECTS AND FUNGUS DISTRIBUTED FOR THE BOARD OF AGRICULTURE AND FORESTRY BY THE DIVISION OF ENTOMOLOGY DURING THE THREE MONTHS, OCTOBER-DECEMBER, 1904.—(Continued).

FUNGUS (Mould)

Name	Number	Date 1904	Feeding upon	Locality
Fungus infected beetles	50	Oct. 20	Japanese beetles	Kaimuki, Oahu
Fungus infected beetles	50	Oct. 21	Japanese beetles	Kaimuki, Oahu
Fungus infected beetles	50	Oct. 21	Japanese beetles	Honolulu, Oahu
Fungus infected beetles	60	Oct. 27	Japanese beetles	Honolulu, Oahu
Fungus infected beetles	70	Oct. 28	Japanese beetles	Manoa Valley, Oahu
Fungus infected beetles	100	Oct. 31	Japanese beetles	Waimanalo, Oahu
Fungus infected beetles	60	Nov. 1	Japanese beetles	Sisal, Oahu
Fungus infected beetles	50	Nov. 4	Japanese beetles	Tantalus, Oahu
Fungus infected beetles	50	Nov. 4	Japanese beetles	Honolulu, Oahu
Fungus infected beetles	50	Nov. 7	Japanese beetles	Honolulu, Oahu
Fungus infected beetles	50	Dec. 1	Japanese beetles	Honolulu, Oahu
Fungus infected beetles	12	Dec. 17	Japanese beetles	Hoopuloa, South Kona, Hawa
Fungus infected beetles	22	Dec. 22	Japanese beetles	Makaweli, Kauai

AGRICULTURE.

REPORT OF JARED G. SMITH CONCERNING AGRICULTURAL WORK DONE AT THE FEDERAL EXPERIMENT STATION DURING 1904.

The Territorial Legislature appropriated, at its special session in June, 1904, the sum of $228.00 per month to assist the Hawaii Experiment Station.

The sum expended from July 1 to Dec. 31, 1904, totals $1509.32, as follows:

For wages of Foreman at the Station at $50.00 per month		$300 00
For partial payment of salary of Chemist, at $16.66 per month		83 00
For wages of one white laborer at the Station, at $37.50 per month		222 50
For a portion of the expense of the tobacco experiments in Hamakua		903 82
This item includes Wages of Superintendent at $5.00 per day	$585 00	
Lumber and supplies	318 82	
Total		$1509 32

This Station has been in process of formation for four years. In the beginning we had nothing but a piece of rocky land,—a narrow strip over two miles in length, the unforested portion thickly covered with Klu, Lantana and Guava,—set aside for the purposes of an experiment station by the Governor of Hawaii. There were no buildings, fences, laboratories, no tools to work with and no land cleared. The larger share of the appropriations made by Congress for this Station during the past four years have been used in getting together an equipment, a place to work and something to work with. The experiments carried

on and the bulletins and reports published have been accomplished rather in spite of obstacles than with outside assistance and support. If the Station can live through until July 1, 1905, we will at the beginning of the fiscal year 1906 be provided with a moderate equipment so that beginning on that date the Station ought to be able to put a larger proportion of the available funds into the work of investigation and experiment.

NEW BUILDINGS.

The Station is indebted to the Territory for its fine new fireproof Library, Laboratory and Office building, a concrete buildnig with iron roof, 60 x 35 feet. Three thousand dollars was provided by the Legislature for this building, and about two thousand was expended from the Federal funds. The Legislature contributed $1,500.00 for a new dwelling. The Station also supplied some of the funds for this structure.

The Station now has on the reservation near Honolulu, one concrete laboratory building, for the Chemist and Horticulturist; one laboratory and insectory for the Entomologist; four dwellings; seven laborer's quarters; stables and outbuildings; one-half mile wire fencing; over 6,000 feet water pipes, 3 in., 2 in., and 1 in.; tanks holding 45,000 gallons of water; and, improvements in the form of roads, trails, grading and the partial or complete clearing of a portion of the farm. The Station owns one work horse, one carriage horse and one saddle horse; and one mule at Hilo.

TOBACCO.

This Station has 1 1-4 acres of tobacco at Pohakea, in Hamakua. One acre has been covered with tent cloth. There is a good equipment in the way of tool shed and seed beds. A small shed originally intended for a tool house has been used for a curing barn. This entirely inadequate structure is now being enlarged so that we expect to be able to handle the next crop of leaf in something like a commercial method.

A report in regard to the Hamakua tobacco experiment is in preparation and will probably be ready for publication in about one month. As this experiment has been a co-operative one, a

large share of the expense having been borne by the Territory, I would suggest that the bulletin be published jointly, either as a Station bulletin of the regular series or as a bulletin of the Board of Agriculture.

An account of the tobacco experiment to date has been published in a recent number of the Hawaiian Forester and Agriculturist.

The results of the first year's work indicate strongly that Hawaii can grow high class cigar tobacco of both wrapper and filler types.

The Station has leased five acres of land near Hilo, which is now being planted with cacao and bananas.

BANANAS.

Quite an extended study of bananas has been made during the last year, some of the results of which are embodied in Bulletin No. 7 of the Station. This study has included methods of cultivation and marketing; soils for banana culture; and a test of thirty or forty varieties of this fruit. A collection of these varieties is planted on the Station experimental plots and also on lands at Hilo under our control.

A number of experiments have been started to determine the relative merits of different methods of cultivation, planting and fertilization. Many different combinations of fertilizing ingredients are being used, the results of which experiments should not only point with strong probability to the kinds of fertilizers which the growers should use but should teach those who are growing bananas under like conditions to determine with certainty the fertilizers needed in their particular locality. From the cultural standpoint experiments are in progress with deep and shallow planting, with large and small holes in a well cultivated field, with plants cut off a few inches above the corm or root-stock and plants not cut, with the planting of sun-dried suckers and those fresh from the plant, and other similar problems. The questions implied in all of these experiments are yet unsettled, difference of opinion prevailing even among those who have had much experience in the culture of this crop.

The shipment of Bluefield bananas received early in January was planted at the Station, and multiplied there.

We have on hand 145 Bluefield bananas in Honolulu, and 130 in Hilo. These are all the property of the Board. The bananas were received at this Station January 1, 1904. One hundred and ten of the 325 corms planted grew or threw out suckers. With the exception of six plants which have been reserved for fruiting, all the plants are being treated to make them throw out new suckers as rapidly as possible. There has been an increase of 165 during 1904

MANGOES.

It is desired to make quite extensive studies of the mango. Some experiments in propagation have been proceeding for several months. Encouraging success and instructive failures have followed experiments in budding this species of fruit-tree. Enough has been done to show the practicability of the process but much more must be done to determine the best methods to follow.

Between thirty and forty varieties of mangoes have been studied. A more detailed study of many of these should be made to discover their respective merits for the different purposes for which mangoes are used. Some of these varieties are doubtless of commercial value and a trade in the finer sorts can undoubtedly be built up in the mainland markets. A mango nursery is being established on the Station grounds for propagation and other experiments.

A devastating mango disease, causing the destruction of the young leaves, the flowers and the fruits has been present in the islands for some time. Last year the mango crop was nearly a complete failure in parts of the islands, largely due to this disease. This blighting effect has been attributed to various causes but it is unquestionably due to a parasitic fungus. The Station has had the matter under study and observation and at the present time experiments are being conducted to determine the best means to control the attacks. The fungus has been determined by the micologists of this Department to be a species of *Colletotrichum* and is comparatively new to science.

THE AVOCADO, OR ALLIGATOR PEAR.

Much the same work is necessary in the case of the Avocado pears as is being attempted with the mango. Even less is known

about budding and grafting this fruit tree than is known of the mango. Yet this method of propagation is of even more importance for the Avocado, for it is wholly unreliable when propagated from seed. There are very many varieties of this fruit growing in different parts of these islands and some are of very excellent quality. If these can be propagated by a simple method of grafting or of budding, it will be possible to establish orchards of trees giving a uniform production of fruit. There is no certainty that a seedling tree will produce a crop of even fair fruit. A small nursery of Avocado pears is being established on the experimental plots of the Station and propagation work will be pursued. An experimental orchard of about one hundred mango and Avocado trees is in a flourishing condition on the mauka lands of the Station tract where the Eucalyptus trees were cut away in 1901, giving them a chance to grow. This orchard partly grown and ready for experimental use is a valuable adjunct to the Station equipment.

CITRUS FRUITS.

It is a well known fact that very large importations of Citrus fruits come into the islands annually. This should not continue in a country so well adapted to citrus culture. Many species and varieties of citrus fruits have been in the islands for years and have done well when given a fair chance. In fact some make a fair showing for themselves even under most adverse conditions. A bulletin, giving simple cultural instructions, for those who wish to grow citrus fruits, will soon be issued by this Station. It is intended also to make a study of the relative adaptability of stocks for different citrus fruits under our local conditions. This is a work involving patient study through many years.

CACAO.

The Station controls five acres of land in Hilo for experiments in the production of Cacao. Three acres have already been prepared for the planting of Cacao trees. Bananas have been planted for shade, which is so necessary for this crop. Three acres have been divided into five sections in which the different varieties of Cacao will be tested and experiments conducted in different methods of cultivation and in propagation by budding and

grafting. Two of these Sections have already been planted. Among other experiments, one is being tried to test the advantages or disadvantages of very close planting with a view to cutting out about half or three-quarters of the trees after they have produced several crops and require more space. In one section the trees are being set 7 1-2 feet apart in the rows and the rows the same distance apart. After the second or third years' crop, the number of trees will be gradually reduced so that eventually they will stand 7 1-2 x 15 feet or perhaps 15 x 15 feet. By this means it may be possible to get a much larger product from a plantation during the first years of its growth.

There is a theory to the effect that the fruitfulness of a Cacao tree will be greatly decreased if its tap-root be cut off or injured in any way. This theory has been challenged by some experienced planters who claim that the opposite is sometimes the case, but the matter is yet unsettled. It is quite possible that this difference of opinion may be accounted for by varying soil conditions. Since it may be a matter of great importance to those who may go into Cacao culture here, this matter will be made the subject of careful study and experiment.

RUBBER.

Rubber is now attracting considerable local attention. This Station has been desirous of doing some experimental work in aid of this industry but up to the present time it has not been possible to undertake it because of lack of means. A few different kinds of rubber producing plants have been grown and some considerable study has been given to the industry as conducted elsewhere. There will be many local problems connected with the industry here, which the Station wishes to undertake if funds are available. It is designed to publish a brief press bulletin giving simple cultural instructions.

PLANT BREEDING.

This branch of horticultural science has made rapid advancement during the past few years. Many new and valuable creations in plant life are appearing every year. By proper cross-fertilization and hybridization and by judicious selection

it is possible to produce almost any desired form within reasonable limits. It is highly desirable that work of this kind should be done here. As an example of the problems which might present themselves, we may cite the present local situation relative to the rice industry. The rice grown here does not meet the demands of the Japanese taste and consequently thousands of dollars worth of rice are being imported and the local industry is being threatened. The Japanese rice does not seem to be adapted to local conditions. The task of the plant breeder would be to create a variety approximating the Japanese form, but suited to the environment which it would find in Hawaii.

Other of our local needs are watermelons, muskmelons, squashes, pumpkins. cucumbers, etc., which would be resistant against the attack of the melon-fly. It is not at all impossible that such varieties could be originated by breeding to produce a hard rind.

Up to the present time lack of facilities and the limited means at the disposal of the Station have rendered such work impossible.

MISCELLANEOUS WORK.

At the Station investigations are being made relative to Hawaiian Tan Barks; the cultivation of Cassava for Starch and Glucose; experiments with Bananas; the nature and method of control of the Mango disease; the chemical composition of Grasses and Forage plants; grafting and budding the Mango and Alligator Pears; Silk raising; Citrus fruits; insects injurious to crops other than Cane, and the relation of humus to fertility.

The H. S. P. A. Experiment Station, with their magnificent equipment of buildings and laboratories and their large and able staff of scientists are amply able to care for all Cane interests in Hawaii.

The Board of Agriculture and Forestry is well equipped with men and means to care for Insect Quarantine and Forestry problems.

The Hawaii Experiment Station cannot afford to attempt any of the work in connection with Cane, Forestry or Insect

Quarantine. Our equipment is not sufficient, our staff is small, our funds too limited.

There are, however, a number of important lines of investigation which would well repay the expenditure of a much larger Territorial stipend than has thus far been given us. I respectfully request the support of the Board to the end that a larger appropriation can be given us.

TOBACCO.

I would like an appropriation of $3000.00 per annum for two years for a continuation of the Tobacco experiment at Pohakea, and an extension of Tobacco cultivation to other districts in the Islands where suitable Tobacco soils exist. I believe that two years more will be sufficient to demonstrate absolutely the practicability of Tobacco culture, up to the point where we can say to those who have capital to invest that good Tobacco can be produced provided proper methods are employed and the proper kinds are planted.

SILK.

I would like an appropriation of $1500.00 per annum for the purpose of demonstrating the practicability of producing raw Silk in Hawaii. In Japan, China and Italy, the three foremost Silk producing countries of the world, the Silk Worms are cared for in the homes of the laborers by the women and children of the household. The men are employed in other work. The production of raw Silk is not considered sufficiently remunerative to engage the time of the whole household.

I believe that the promotion of the care of Silk Worms by the families of plantation laborers on lands above the cane would lead ultimately to more stable labor conditions on the plantations, in that the formation of home communities would, in a measure, attach the laborer more closely to the soil. If a moderately remunerative home occupation can be provided for the women and children so that the laborer will be content to stay in one locality, the plantations would be able to get and keep a steadier and more reliable class of laborers in their employ.

An appropriation for this purpose would need to be exempted from the clause of the law relative to the employment of Asiatics by the Government, both because we would have to employ Japanese as instructors in the art of Silk culture, and because the laborers who would benefit from the establishment of this industry would be mainly of that nationality.

COFFEE.

I would like an appropriation of $1500.00 per annum for two years for an investigation of certain phases of the Coffee industry.

If Coffee were sold in the world's markets in accordance with merit as determined by aroma and flavor I believe that Hawaiian Coffee would be at the top of the list. We can grow Coffee in Hawaii. There is no trouble on that score. The average yield per tree in Hawaii in about three times what it is in Brazil.

But unfortunately fashion, not merit, rules the price of Coffee. A rather large proportion of our Coffee, when properly graded, closely resembles the best grades of Java in shape and size of berry. But there is a marked difference in the color and odor of the two. Color and odor are apparently what the buyers of fancy Coffee are willing to pay for. The grading, cleaning and polish of the berry, and even the cupping qualities of the roasted article are subordinate. A certain shade of color and a certain odor have come to be associated in the minds of Coffee experts with "Old Government Java" or "Old Mocha." If we could, by proper methods of fermentation and manipulation, get into our Hawaiian Coffee the peculiar dirty yellowish brown color and Oriental smell, our Hawaiian Coffee could be sold for double the price which it now commands. I believe that this is possible, and that it would pay to attempt it.

HORTICULTURE.

I would like an appropriation of $1000.00 per annum for two years to continue experiments which we have made in the shipment of Mangoes, Papaias and Alligator Pears and other

tropical fruits in cold storage to the Eastern markets. We have made one shipment of Alligator Pears to New York in cold storage. Some of the fruit got through in good shape, some not. We were able to keep pears in cold storage seven weeks in Honolulu without deterioration in flavor or texture. The points to be worked out are the best temperatures and the methods of packing for storage and shipment. I believe that it is possible to work up a good market on the mainland for tropical fruits, and that successful experiments will lead to the development of a profitable commercial industry, capable of almost indefinite extension.

GREEN HOUSE.

A green house for culture and propagation experiments in horticultural investigations, such as the study of Fungus diseases of cultivated plants; the cross pollination of Flowers for the production of new varieties, and the propagation of economic plants for more general distribution throughout the Islands. Such a structure would cost about $3000.00. The resources of the Station will not permit the erection of a green house for some years to come. It is absolutely necessary for economy of time and effort that a plant house be provided as soon as possible.

IRRIGATION.

Irrigation and agriculture are almost synonymous terms in all the leeward districts of Hawaii. Without water for irrigation during the dry summer months practically nothing can be grown. This Station is very much in need of an improved water supply. If a reservoir were constructed at the 850 foot level on the Station Reservation it would enable us to be independent of the Honolulu Water Works. During the last three years there has been a shortage of water, even at times for household purposes, during the summer months, so that no plot or field experiments requiring the use of water have been possible.

To provide an adequate water supply for irrigation of crops I would like an appropriation of $10,000.00 for the construc-

tion of a 3,000,000 gallon reservoir just below the forest on the upper part of our reservation.

To recapitulate, I respectfully request the support of the Board of Commissioners of Agriculture and Forestry in obtaining from the Territorial Legislature appropriations for this Station as follows:

	Per Annum.
Tobacco work	$ 3,000 00
Silk culture	1,500 00
Coffee	1,500 00
Cold storage of fruits	1,000 00
A total of	$ 7,000 00
And for a green house	3,000 00
For a reservoir	10,000 00

This would make a total appropriation for the biennial period of $27,000.00, a less sum than is appropriated by Congress.

JARED G. SMITH,
Special Agent in Charge of Hawaii Experiment Station.

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J. HOLZER
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BOSTON, MASS.